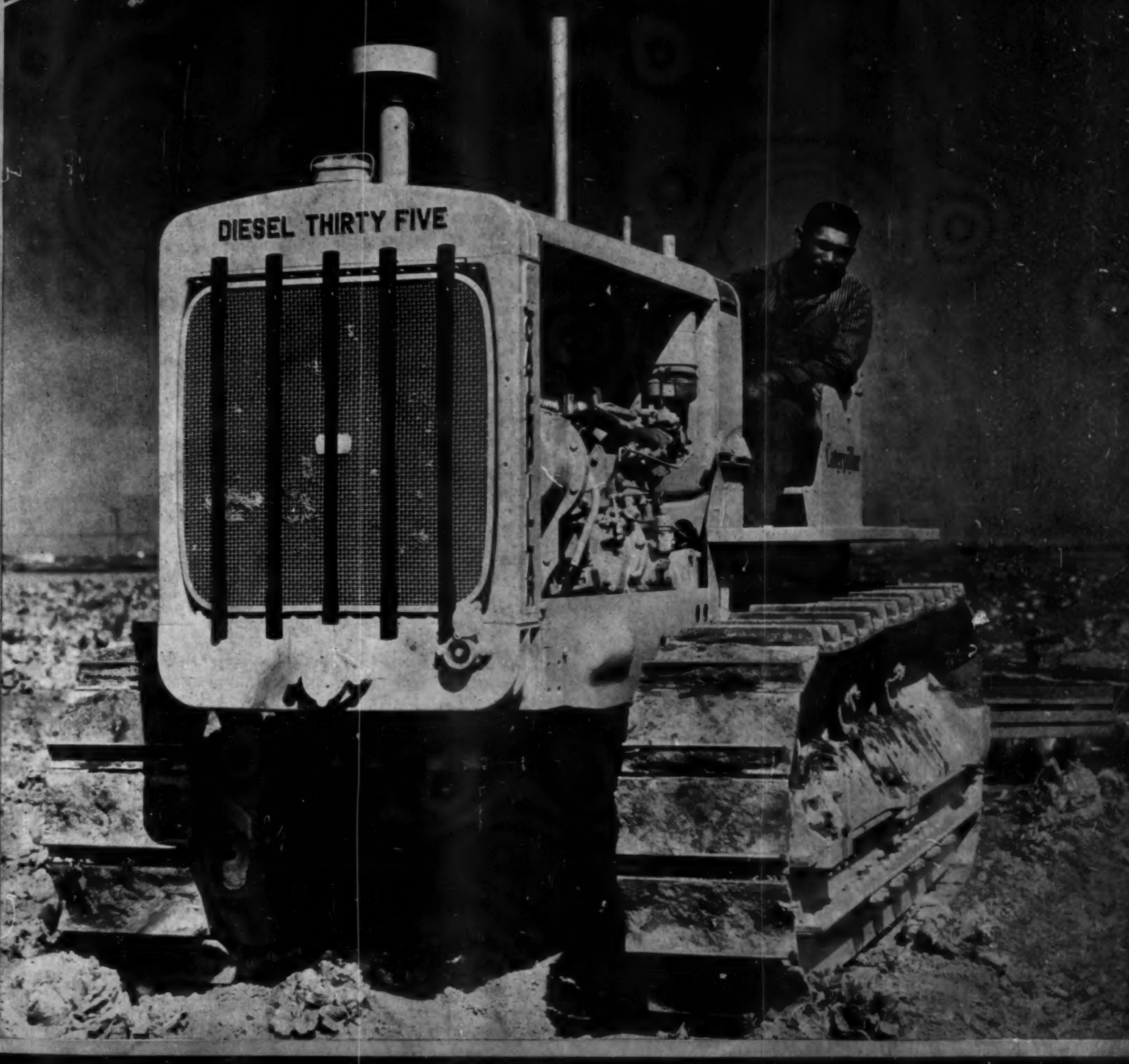
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



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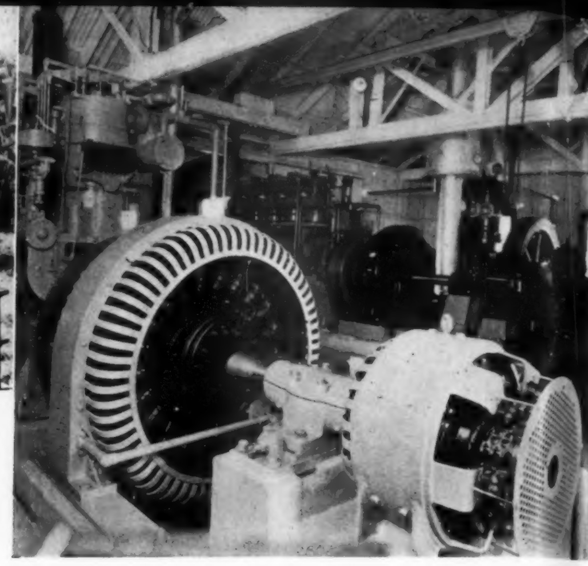
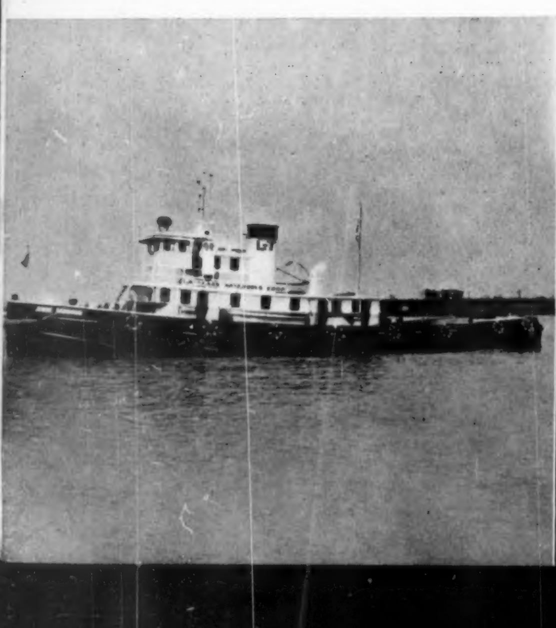
U.F.CO.






SAN DIEGO & CORONADO FERRY CO

DIESEL PROGRESS

CONTENTS FOR JUNE

DIESEL PROGRESS for June, 1935, Vol. I, No. 2. Published monthly by Diesel Engines, Inc., 2 West 45th St., New York, N. Y. Tel. MUrray Hill 2-5092.

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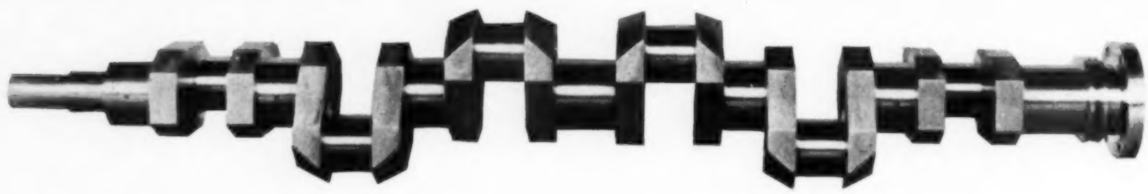
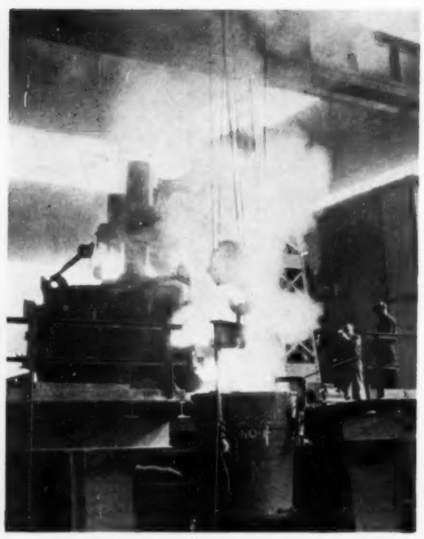
Editor and Publisher..............REX W. WADMAN
Managing Editor..................JOHN E. OSMUN

CUMMINS ENGINE COMPANY

use

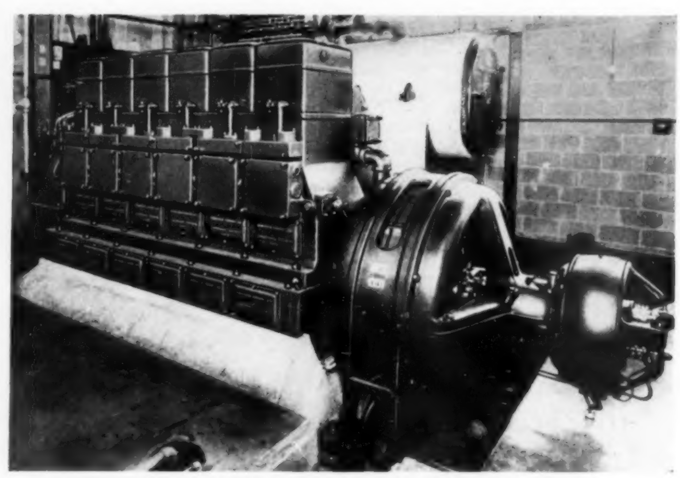
National Forge & Ordnance Co. Products





CONSISTENTLY fine quality of material combined with accurate workmanship to micromatic limits places National Forge and Ordnance Company Crankshafts in an outstanding position among Diesel Engine Manufacturers.

Complete control of all Processing from selection of the melting charge to the finished condition is National Forge and Ordnance Company's guarantee for maintenance of quality in Crankshafts and various other types of forgings furnished to leading manufacturers in the Diesel Industry.



Six Cylinder 200 hp. CUMMINS Diesel Engine

BASIC ELECTRIC STEEL

CARBON, ALLOY, CORROSION RESISTANT AND SPECIAL STEELS SMOOTH FORGED, ROUGH OR FINISH MACHINED, HEAT-TREATED TO SPECIFICATIONS . . . INGOTS AND FORGED BILLETS

NF

National Forge & Ordnance Co.

Irvine, Warren County, Penna.

NF

DIESEL PROGRESS

REX W. WADMAN, Editor and Publisher

EDGAR GUEST wrote these words a good many years ago, but he might just as well have written them yesterday and about the Diesel Engine because, from one end of this country to the other, for that matter, from one end of the world to the other, the Diesel Engine is taking hold of jobs which couldn't be done and is doing them, doing them well.

Somebody said that it couldn't be done,
But he with a chuckle replied
That "maybe it couldn't," but he would be one
Who wouldn't say so till he'd tried.
So he buckled right in with the trace of a grin
On his face. If he worried he hid it.
He started to sing as he tackled the thing
That couldn't be done, and he did it.

Somebody scoffed: "Oh, you'll never do that;
At least no one ever has done it";
But he took off his coat and he took off his hat,
And the first thing we knew he'd begun it.
With a lift of his chin and a bit of a grin,
Without any doubting or quiddit,
He started to sing as he tackled the thing
That couldn't be done, and he did it.

There are thousands to tell you it cannot be done,
There are thousands to prophesy failure;
There are thousands to point out to you one by one,
The dangers that wait to assail you.
But just buckle in with a bit of a grin,
Just take off your coat and go to it;
Just start to sing as you tackle the thing
That "cannot be done," and you'll do it.

— EDGAR A. GUEST

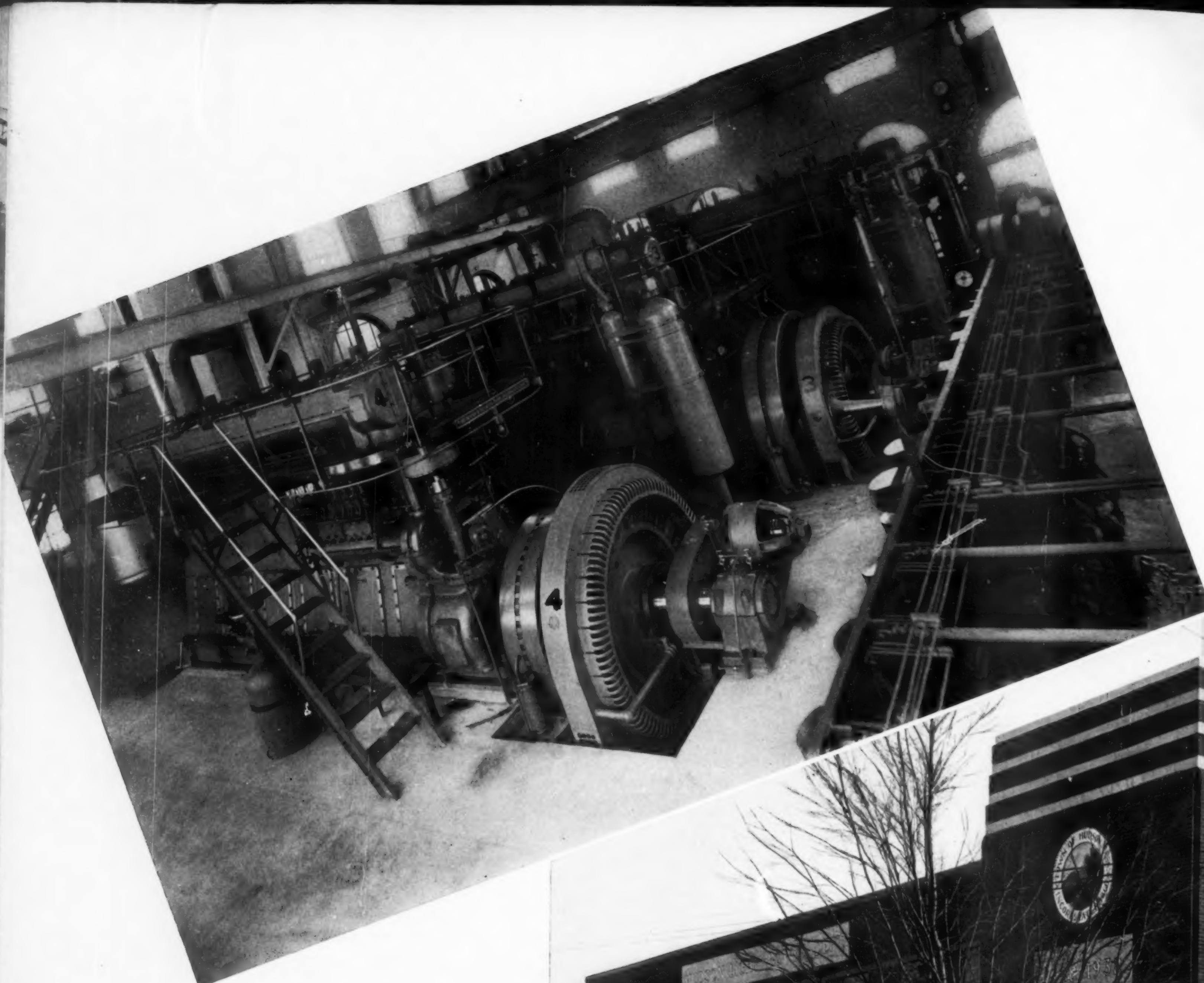
From *"The Path to Home,"*
The Reilly & Lee Co.

Most of us know that the Diesel Engine is a highly efficient and economical source of power, few of us stop to remember what a hog for work it is. A gasoline engine will run up against a load and when it reaches its peak, run away from the load. A steam engine slugs into a load but when it reaches its maximum steam pressure, quits cold. Not so a Diesel, it takes hold of a load, handles it up to its normal rating and then keeps on going up and up until it busts itself, unless you put a governor on it to restrain its enthusiasm within reasonable limits. In other words a Diesel has a better overload capacity than any known type of prime mover. So when you have a job which can't be done, think of the Diesel Engine, it will do it for you, and do it for you very economically.

THANK YOU!!!

For the letters you've written in to me in regard to our first issue. I wish I could answer them all personally, but it just can't be done, too many of them. Will you, individually and collectively, accept my sincere thanks, on behalf of myself and of my staff, for the perfectly marvellous things you have written about our first effort. We tried earnestly to do a good job, that we have apparently succeeded delights us — naturally, but your comments make us very humble, because we realize we have to do a bigger and better job each issue to hold your interest, to hold your enthusiasm. We are going to try to do just that — again, from the bottom of my heart, I thank you.

Rex W. Wadman



Hudson's light and power plant equipment comprises two 900 hp. 17" x 24", 8-cylinder, air injection McIntosh & Seymour Diesels, direct connected to 615 kw. generators, one 675 hp. 17" x 24", 6-cylinder, air injection McIntosh & Seymour Diesel, direct connected to a 460 kw. generator and one 1,200 hp. 20" x 24" 6-cylinder mechanical injection McIntosh & Seymour Diesel, direct connected to an 835 kw. generator.

Exterior of Hudson's Cherry Street Station.

TALE OF TWO CITIES
1935 Version

LAWRENCE, MASS.
Burdened with high electric rates by Power monopoly

HUDSON, MASS.
Served at lowest average rate in New England by modern, municipally owned Diesel plant

Leland D. Wood, manager, Hudson Light and Power.

SOME forty miles distant from each other in Eastern Massachusetts lie two communities, Lawrence, one of the greatest textile centers in the world, and Hudson, a typical New England manufacturing town with a population of about 8,500.

If the economic laws of mass production hold true in the utilities field Lawrence, with more than ten times the number of domestic electric current users than Hudson, should be paying much less for it per user than Hudson does. But quite the reverse is true.

Lawrence has the unenviable distinction of paying the highest rates for electricity of all Massachusetts cities under 100,000 in population, while by contrast Hudson claims the lowest average rates in New England.

These facts were broadcasted to many thousands of radio listeners one night recently in no uncertain terms by two Bay State legislators urging the passage of House Bill No. 245 which would authorize any Massachusetts city or town served unsatisfactorily by a private power company to build and operate its own electric plant.

The first speaker, the representative from South Lawrence, delivered a scathing attack on the Lawrence Gas & Electric Company, a subsidiary of the New England Power Corporation, charging outright extortion and exposed the alleged trickery of the light company in submitting a new schedule of lower rates, which, figured out, would net the householders of Lawrence the huge saving of about two cents a month on their electric bills.

The second speaker, a state senator, held up as an example of efficiency and good service, the Light and Power Department of the Town of Hudson which, after paying all expenses, bond and interest indebtedness, transferred to the town's treasury last year the sum of $10,180.24, an amount larger than its taxes would be, were the plant privately owned. Comparisons are odious and this one must surely have been to any officials of the power chain who might have been listening in during those enlightening disclosures. But for the purpose of easy comparison here is what residents of the two communities pay for 60 kilowatt hours:

LAWRENCE (Effective Apr. 1, 1935)	Net	HUDSON (Effective July 1, 1934)	Net
First 30 kwhrs.	$2.55	First 20 kwhrs.	$1.00
Next 30 kwhrs.	1.80	Next 40 kwhrs.	1.20
TOTAL	$4.35	TOTAL	$2.20
Minimum charge $9 a year			

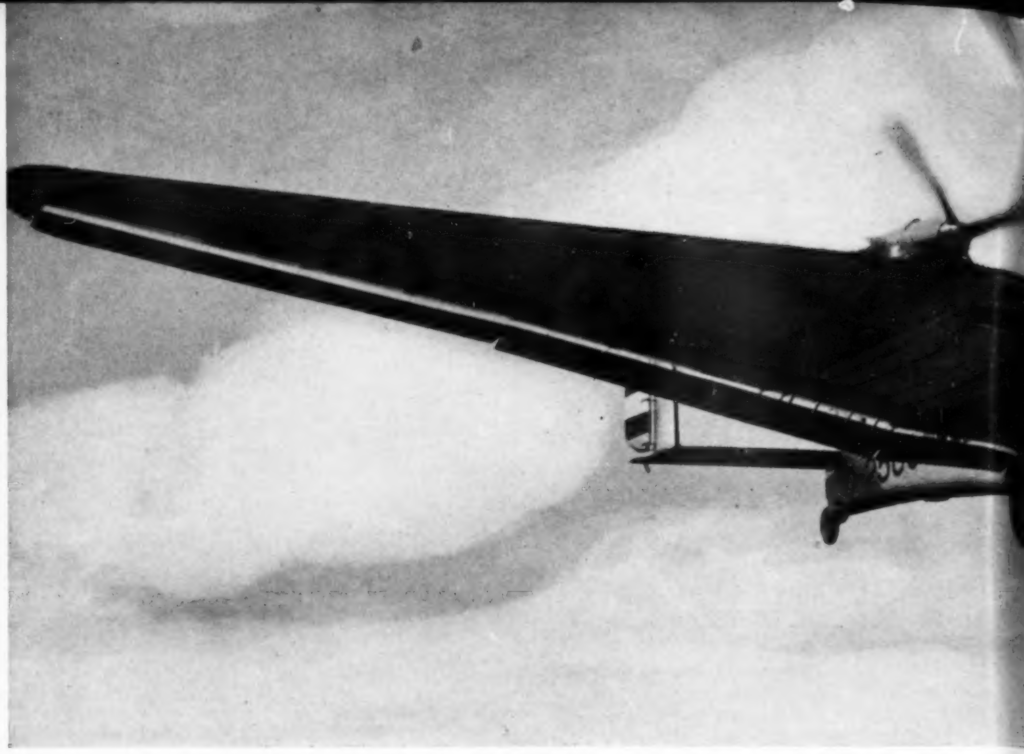
Why the wide discrepancy? Why should Lawrence pay practically twice as much as Hudson for a service that isn't even as good?

This is what Lawrence people and nearly 7,000,000 others in the Commonwealth of Massachusetts want to know today—why they should be forced to pay exorbitant rates when a town like Hudson gets excellent service at a fraction of the cost they now pay.

In his inaugural speech last January Governor James M. Curley pledged the people of Massachusetts relief from the burdensome charges of the power chains. Privately owned power companies have had very much their own way in Massachusetts for a long time. The handwriting upon the wall may not turn out to be just another Neon sign this time. What several of the 41 municipally owned lighting plants throughout that state, particularly Hudson's, have done to bring about low electric rates in the last few years has opened the eyes of thinking people.

Hudson's municipal enterprise started originally in 1897 with a $40,000 investment in a small steam power station, eleven miles of lines and 61 customers. Business grew until in 1917

. . . . *And now please turn to page 48*



The "Hindenburg" in flight. Junkers Model G38, Diesel motored.

GERMAN DIESEL TRANSPO

ANOTHER giant transport plane has joined the fleet of Diesel engined aircraft now being operated by the Deutsche Lufthansa on regular German air routes.

The new four-motored ship, called the *Hindenburg* was recently completed at the Junkers Flugzeugwerk A.G. at Dessau. This plane is a sister ship of the *Deutschland* which now flies the Lufthansa route between Berlin, Copenhagen and Malmoe, Sweden.

Like the *Deutschland,* the *Hindenburg* is a model G38 Junkers plane equipped with four Jumo 4 Diesel engines of 750 hp. at 1620 rpm. All engines are also built by the Junkers Co.

The Jumo 4 is a six-cylinder two-cycle engine designed with double-crankshaft and opposed pistons. It weighs 2.79 per hp. and has a cubic inch displacement of .287 per hp.

Although Diesel aircraft engines weigh more per hp. than the conventional gasoline engines, they consume less fuel per hphr., so that the gross weight of both engine and fuel for both types of engine becomes practically the same in a flight of slightly over five hours. In full-throttle flights of a longer period than this, the Diesel will show an operating advantage which more than cancels the weight objections as far as long range operations are concerned.

In addition to the advantage in performance of Diesels for long range operations, the saving in fuel costs is far more important, because the engine not only consumes less fuel, but fuel that usually costs at least two-thirds less. Add to these, the further advantage in the reduction of fire hazard through the use of Diesel fuel, and sum total of the many advantages of Diesel aircraft engines indicates why the Junkers Company has been willing to spend so much time and money in its development.

In design this Junkers aircraft engine has several unique features that have resulted in an excellent performance record in actual flying operations. No other two-cycle Diesel aircraft engine has given a better performance nor have any been so thoroughly tested under daily flying conditions on regular air routes.

Flight Captain Brauer of the *Deutschland* is most enthusiastic about the operating economy of his plane between Berlin and Copenhagen. Fuel oil per liter in Germany costs 11 Pfennigs, while gasoline costs 33 Pfennigs so there is a two-thirds saving in the cost of fuel alone. Beside this, gasoline aircraft engines in this same plane would consume more gasoline than the Diesels do fuel oil, so that if gasoline were used the cost becomes four times as much.

From an economy standpoint Diesel equipped planes are revolutionizing the entire aviation industry, and in their development and successful operation on regular air routes, Germany now takes the lead.

The development of large transport Diesel planes by Germany is of more than the average interest at this time because of the war rumors hanging over Europe. It isn't very difficult to visualize the *Hindenburg* and *Deutschland* as tremendously effective long range bombers in case of war, their cruising capacity being so much greater than gasoline engined planes of the same horsepower.

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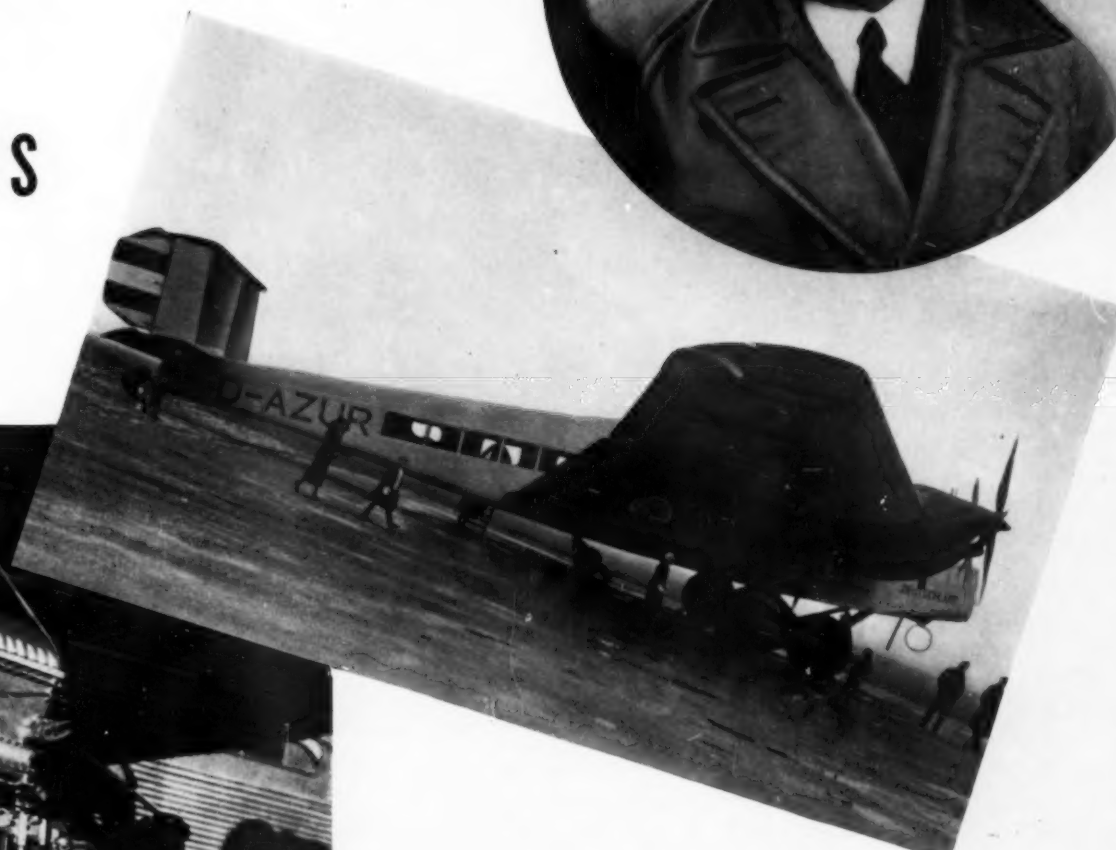
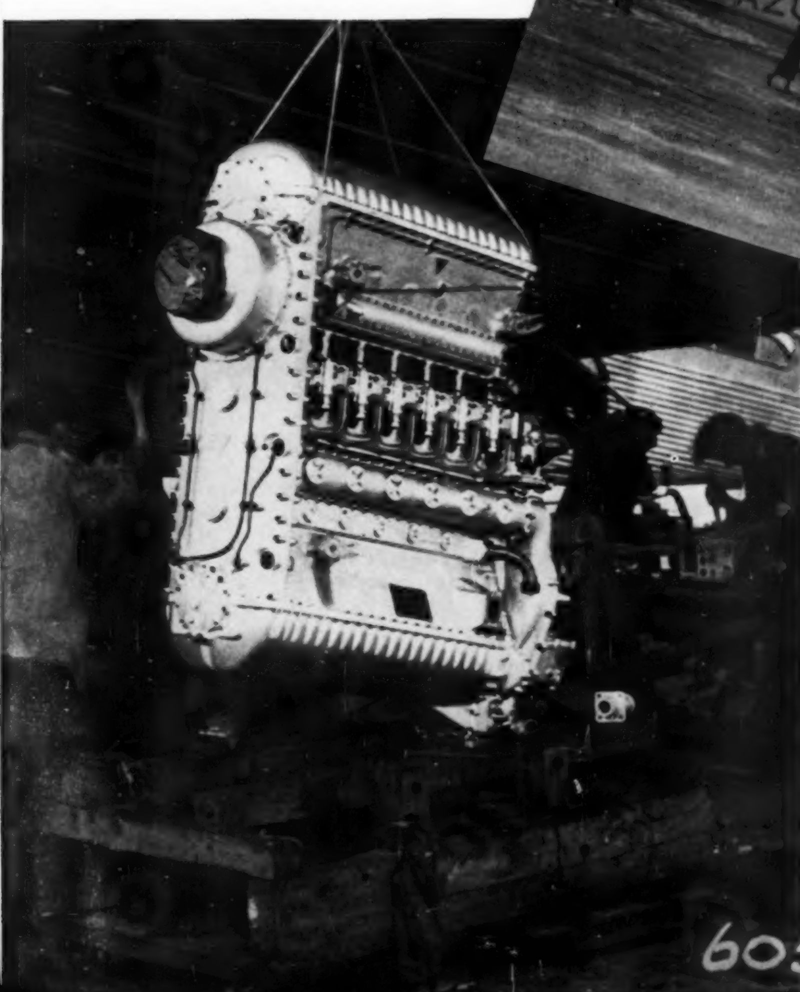
Flight Captain Brauer of the "Deutschland" who has flown more than a million kilometers in the service of the Lufthansa.

NSPORT PLANES





Above — The "Deutschland" just after completing one of her regular flights between Germany, Denmark and Sweden.

Left — Placing one of the four Junkers Jumo 4 Diesel engines in position during construction of the "Hindenburg."

Fifty-foot Wheeler Playmate yacht. Speed 13 miles per hr. with 100 hp. Winton Diesel.

STANDARDIZED DIESEL CRUISERS

By WILLIAM J. DEED
NAVAL ARCHITECT

THE *Standardized* Diesel Cruiser is here! Not over five years ago many looked forward and *hoped* that they would soon be able to step into the show room of a boat company and buy a standardized Diesel cruiser. That day has *arrived.*

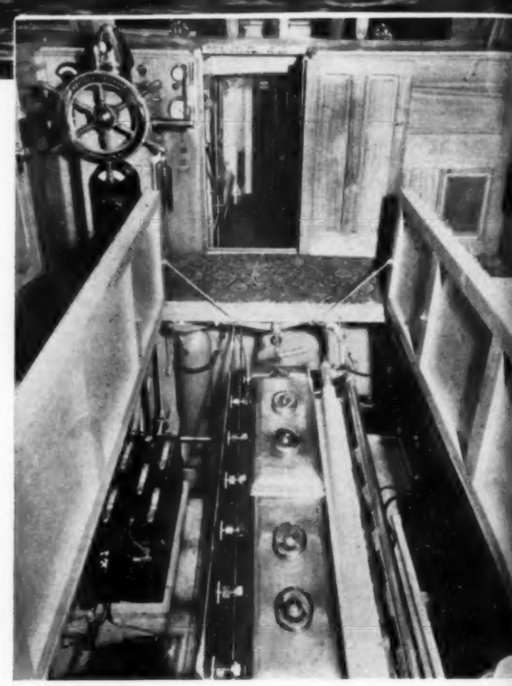
We do not refer to yachts with Diesel and oil engines, since any boat designer or builder will produce a special Diesel cruiser for you; we refer to boats which have been developed and perfected, produced in advance of purchase and standardized both as to hull and power plant.

Two outstanding requirements of the yacht buyer which the Diesel engine satisfies, as does no other form of power, are those of safety and economy. To many that peace of mind which attends the use of a less volatile and explosive fuel than gasoline is of paramount importance, while other experienced yachtsmen, recognizing that most of the hazard does not exist with proper care and handling in any case, prefer to regard the greater cruising radius, the greater freedom from stopping a pleasant trip to take on more "gas" and the lesser cost of the fuel itself as the paramount issues.

Both Mr. Preston L. Sutphen, sales manager of the Elco Works and Mr. Wesley L. Wheeler, designer and sales manager of Wheeler Shipyard, Inc., leading exponents of Standardized Diesel Cruisers, are unanimous in their expression of the keen interest which the prospective boat buyer feels in the Diesel cruiser and state that both prospective business and actual orders increase each year.

The Elco Works standardize on the Buda Diesel engine, while Buda or Winton Diesels are optional equipment in Wheeler Diesel cruisers. Mr. George W. Codrington, President of the Winton organization, long ago foresaw the possibilities in the standardized Diesel cruiser and fostered its development.

While few yachtsmen operate their boats sufficiently long during the season to obtain all the economical advantage inherent in the Diesel engine, economy is uppermost in some buyers' minds, while safety interests others. Much depends upon the individual's attitude toward the slightly increased cost of the standardized Diesel cruiser over the stock cruiser with gasoline engine.



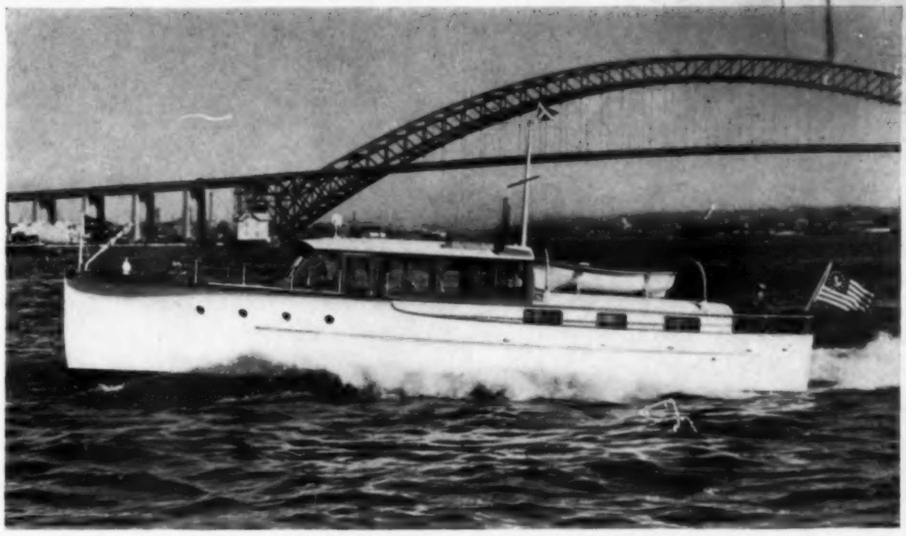
100 hp. Winton Diesel installed on Wheeler Playmate 50.

This slight cost differential is bound to exist because of the greater price per horse power of the Diesel engine due to manufacturing costs which cannot be entirely eliminated. Mr. Guy Wright, sales manager of The Buda Company says: "Diesel engines cannot be sold at an equal price per horse power as gasoline engines. Unquestionably when the Diesel manufacturer can get into greater production

than at the present time this price can be reduced."

Cost is also influenced by the Diesel engine having higher compression and an expensive fuel injection system, heavier electrical parts and requiring greater precision in manufacturing mechanical details.

Diesel cruisers operate at an average of about one-third the fuel cost of a similar boat with equivalent gasoline power, utilizing Diesel oil or furnace oil which may be purchased at practically every port for six to eight cents a gallon. In fact, such economy is often exceeded.



Above — Forty-eight-foot Elco cruiser, and below — Thirty-eight-foot Elco cruiser. Both equipped with Buda Diesels.

85 hp. Buda Diesel installed on Wheeler Playmate 34.

Below — Thirty-four-foot single cabin Wheeler Playmate. Speed 13 miles per hr. with 85 hp. Buda Diesel.

One owner states: "My cost of operation has been reduced at least 80 per cent," this after replacing a 45 hp. gasoline engine with a 65 hp. Diesel. From the 60-gallon tank in his 34-foot cruiser the gasoline engine formerly consumed 18 gallons a day at 21 cents, or a cost of $3.78, while the Diesel engine now burns but 10 gallons, or 75 cents worth. This is at the rate of only a cent and a half a mile. The Diesel engine referred to is now standard power for the 34-foot standardized Diesel cruisers of which this hull is a duplicate, therefore similar economy may be expected in the standard cruiser.

Vision of a vast market awaiting the successful manufacturer of a Diesel engine which would compare favorably with a gasoline engine, fostered development of the Standardized Diesel Cruiser, for the early oil engines with their heavy weight, slow speed, vibration and noise were not satisfactory small boat engines. Without going into technical details, suffice it to say that the 1935 small boat Diesel is light enough and of sufficiently high revolutions to replace gasoline engines with marked success. Mr. Guy Wright, of The Buda Company, expresses the opinion that the Diesel cruiser is feasible in a craft as small as 24 feet, but the smallest Standardized Diesel Cruiser now marketed is 32 feet long. In the very small boat the cost of the Diesel engine may exceed that of the hull, thereby increasing the price above that of the small gasoline cruiser, magnifying the premium paid for oil engine power. This has been one of the problems to be solved.

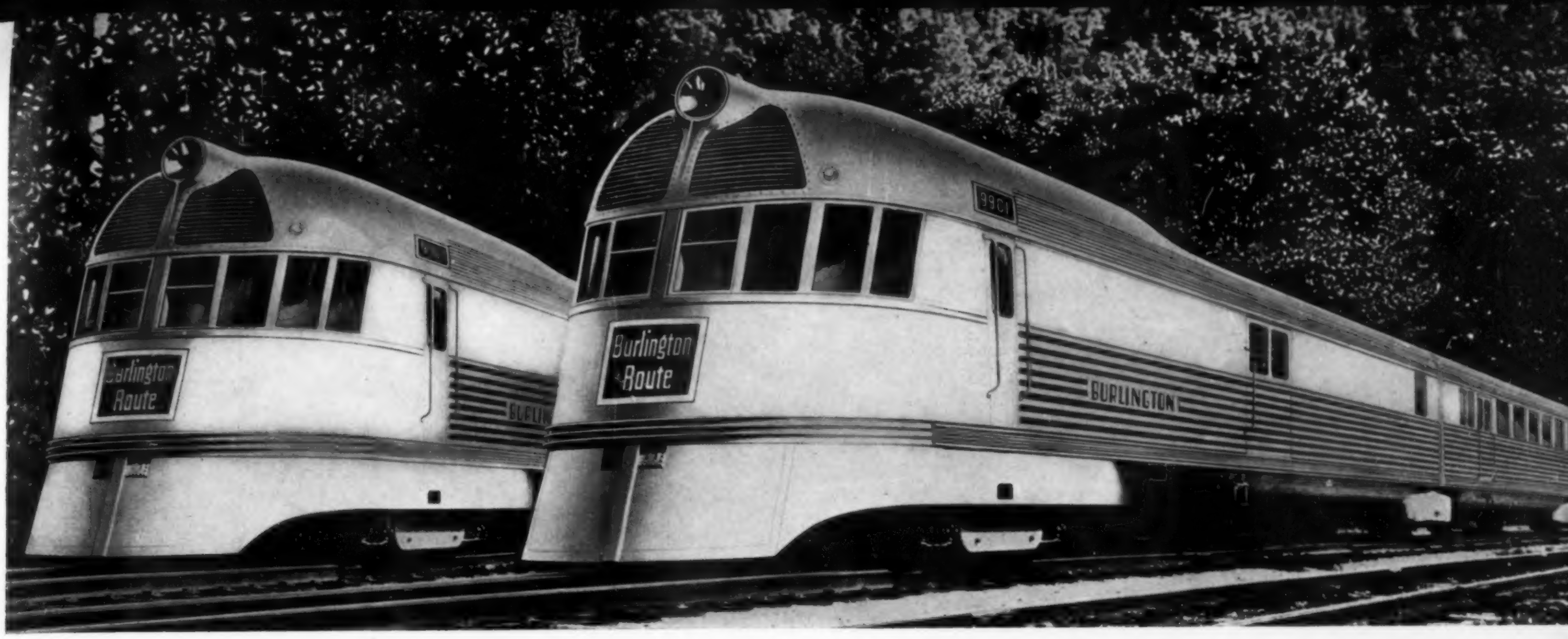
Marine insurance costs from one-quarter of 1 per cent to one-half of 1 per cent less for the Standardized Diesel cruiser than for the gasoline craft, the exact rate depending upon the boat itself, the builder, etc. The reduction in rate should be far more, however, in the light of experience.

The latest Diesels of light weight and high speed operate with very little more noise and odor than the gasoline engine, much depending upon the operator, of course, and the quality of the fuel. With care and attention to cleanliness the Diesel will not cause objectionable odor or smoke in the exhaust nor about the motor compartment.

Insulation of the engine compartment by one of several sound-proofing materials is adopted to nearly prevent the pulsation of the motor reaching persons in the cabins or on deck. Such is accepted general practice in Diesel cruisers and your standardized Diesel cruiser may be even more effectively sound-proofed than a standard boat with gasoline power, although some builders insulate all their cruisers.

Then there is the matter of providing an engine foundation which will practically eliminate all objectionable tremor. Carefully designed and proportioned motor beds accomplish this, while one builder, The Elco Works, isolate from the hull 90 per cent of engine vibration through the use of steel engine gird- . . . . *And now please turn to page 42*

Forty-eight-foot Wheeler motor sailer. Speed 10 knots with 125 hp. Buda Diesel.



TWIN ZEPHYRS FOR THE TWIN CITIES

A case where two of a kind will undoubtedly mean a full house

POPULARIZING railroad travel through the installation of Diesel powered streamlined trains has proved highly successful on the Burlington lines. Since the inauguration of the first Zephyr for regular service, passenger traffic on the line as a whole has increased 26 per cent, while traffic on the Zephyr alone has shown an increase of 193 per cent compared with its steam predecessors.

Thirty-two per cent of the passengers have indicated they would have traveled by automobile, bus or airplane had it not been for the Zephyr. A fourth car is being built for the train to accommodate the increased traffic.

So popular did the first Zephyr prove with the public, that the Chicago, Burlington and Quincy Railroad soon decided to increase its investment in this modern type of streamlined equipment. An order for Twin Zephyrs was placed with the Edward G. Budd Mfg. Co., builder of the original Zephyr and of the Flying Yankee recently delivered to the Boston-Maine and the Maine Central Railroad. The twin Zephyrs are now in service on the Chicago-Minneapolis-St. Paul run.

To maintain the six and a half hour schedule, the twin trains, one running in each direction daily, cover the 431 miles between Chicago and the Twin Cities in 390 minutes, an average of 66.2 miles an hour, including stops. The cruising speed will be 100 miles an hour.

Patterned after the original Burlington Zephyr, and, like it, powered by a Winton Diesel engine, the new three-car Zephyr weighs but 227,000 pounds whereas one sleeping car such as is used on crack trains weighs a little under 200,000 pounds. This light weight, in combination with stream-lining, rapid acceleration and deceleration, and the economy of the power plant that consumes inexpensive furnace oil, results in a substantial saving in operating costs as well as in a reduction of running time. Operating costs approximate 32 cents a mile with Diesel power as against 80 cents with steam operation.

The coming of the first Zephyr about a year ago has developed into a whirlwind of popular demand for new Diesel powered streamlined trains and set the pace for a decided speeding up of all railroad travel.

Speed with safety and comfort is the goal of this new phase of railroad operation. By attaining this goal, American railroads can send out determined appeals for more passenger business and recover much of the passenger revenue lost to other forms of transportation. And so the race goes on between the railroads and their competitors, between parallel railroad lines, between steam and Diesel, between streamlined and conventional type carriers.

Among the other railroads that are now using Diesel streamlined trains to step up their speed and attract more passengers, are the Union Pacific, the Boston and Maine, the New York, New Haven and Hartford, and the Gulf, Mobile & Northern. Orders for new Diesel equipped trains have also been placed by the Illinois Central, the Union Pacific and the Baltimore and Ohio.

In the north, east, south and west, the Diesel engine is speeding up railroad schedules and creating a demand for modern streamlined equipment by the American railroads. Passenger traffic responds to speed and comfort.

Municipal power plant building.

Power profits paid for this new water plant.

GAIN DURING EIGHT YEAR PERIOD

Reduction in Total Indebtedness	$ 95,049.94
Sewage Treatment Plant........	45,463.32
Diesel Unit for Power Plant....	21,000.00
Power Plant Equipment........	10,000.00
Water Plant & Well System.....	37,556.91
Additions to Water System......	4,509.55
Additional Cash Balance........	6,499.42
	$220,079.14

COMPARATIVE STATEMENT

	1926	1934
Outstanding Bonds & Warrants	$ 82,891.94	$ 6,000.00
Due on Engines.....	28,158.00	None
Total Indebtedness .	101,049.94	6,000.00
Cash Balance, Jan. 1	44,437.54	51,936.96
Corporation Tax Levy	46 mills	20 mills
Top Lighting Rate..	11c	7.2c

KILOWATT HOUR COST—1934

KILOWATT HOURS GENERATED 1,023,200

	Total Cost	*Cost per Kw. Hr.*
Fuel oil	$4,662.37	.00456
Lubricating oil	796.14	.00078
Repairs	478.70	.00046
Labor	4,914.21	.0048
Water	92.37	.00009
Misc.	120.00	.00011
	$11,063.79	.0108

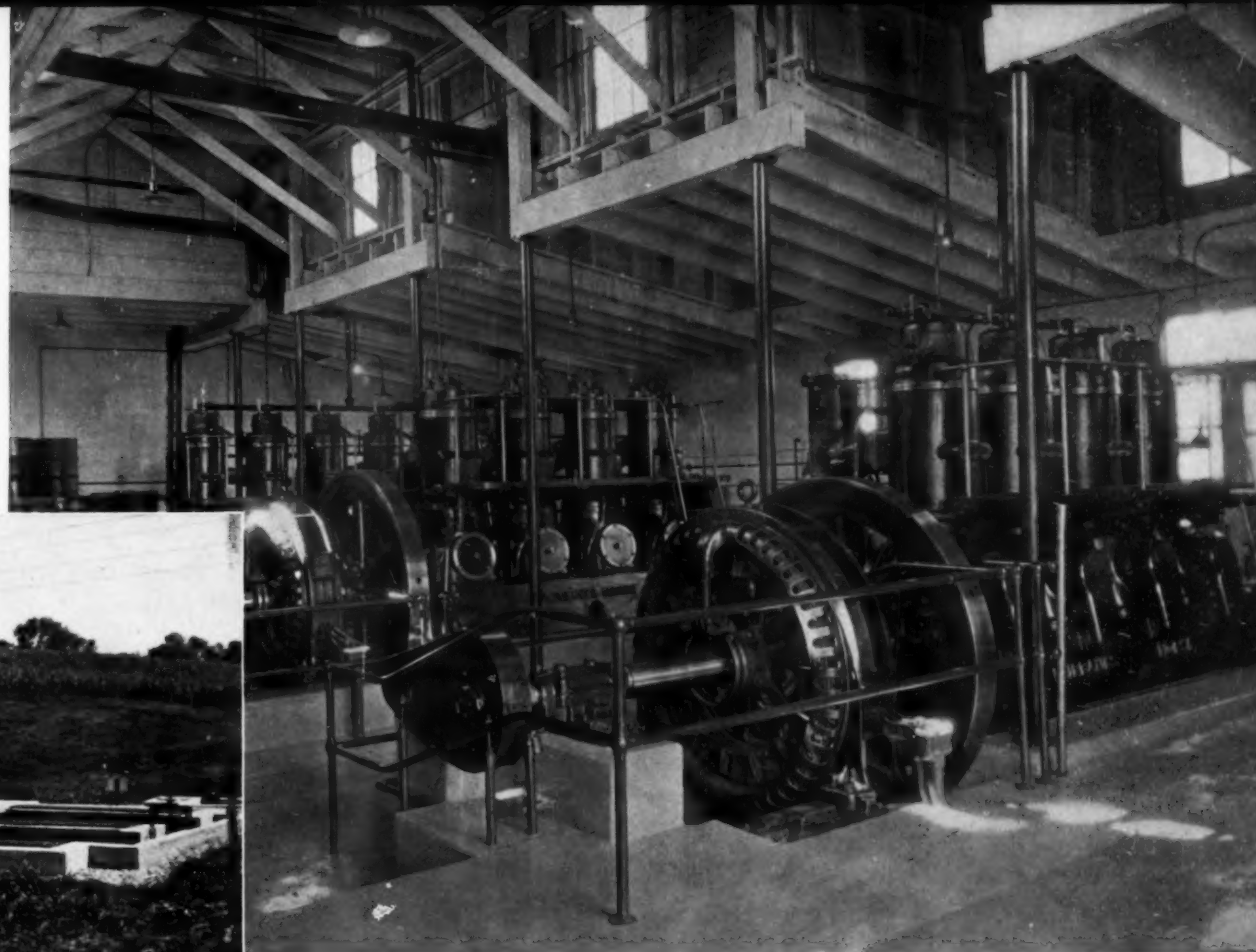
DIESEL ENGINES

REDUCTION in total bonded indebtedness of $95,049.00, addition of civic improvements totaling $118,529.78, and a cash balance increase of $6,499.42, or a total gain of $220,079.14, comprises, in brief, the record of achievement of the municipally-owned utilities in Bloomfield, Iowa, during the last 8 years.

Bloomfield, a city of 2300 population, entered municipal ownership of its utilities back in 1892 when a direct current, steam-driven light plant was purchased from the Bloomfield Light Company. That purchase was financed by a $14,000.00 bond issue. The same year a municipal water system was inaugurated, consisting of about ten blocks of water mains, an elevated tank, surface reservoir and a 300-foot well.

From its beginning, Bloomfield's utilities have risen to an enviable position among municipalities. The municipal light plant has been the "gold mine" which has enabled this south-

Imhoff tank and pump house paid for out of power plant profits.



Installation of three Fairbanks-Morse 14" x 17" Diesel engines of 200, 240 and 300 horsepower.

S SAVE $220,079.14

By BRUCE B. WATTS
Supt., Light and Water Dept.

Many City Fathers may read these figures and weep because their municipalities failed to realize on possible power plant profits such as these.

eastern Iowa county-seat to add $118,529.78 in municipal improvements, all paid for, and at the same time reduce the city tax levy to one of the lowest figures in the state and provide light and power at bargain prices.

Let us review the progress of the municipal light plant in detail. Shortly after the turn of the century, larger equipment was installed in the plant at various intervals until 1919, when the entire city was re-wired for alternating current. Two corliss steam engines, directly connected to alternators, were installed.

By 1924, the boilers were becoming inadequate to take care of the increasing load and city authorities faced a perplexing problem. Three alternatives faced the council members — a bond issue for the installation of new boilers, purchase of current from some high line concern or the installation of Diesel engines. After considerable cogitation, council members decided to purchase two Diesel engines on the rental payment plan, without a bond issue. That decision launched a new era in Bloomfield's utilities as evidenced by the progress in the city's finances.

The two Diesel engines, of 200 and 300 horsepower, were started in service in 1925 and the steam plant passed into history. At the time of purchase, city authorities were told that the Diesel equipment could be paid for in three years time by the saving in operation costs between steam and oil. That promise was fulfilled in eighteen months when the light fund had accumulated enough surplus to pay the balance on the engines. This record prompted city authorities to add a third unit of 240 horsepower. This third unit was paid for out of earnings in less than a year. Three units had been purchased and paid for in less than three years. Now the City fathers were prepared to sit back and enjoy the harvest of a frugal investment.

The present light plant consists of three Fairbanks, Morse, Model Y-VA 14" x 17" Diesel engines of 200, 240 and 300 horsepower, direct connected to three phase alternators. The switchboard is a Westinghouse 7 panel and includes voltage regulator, graphic wattmeter and graphic voltmeter, power factor meter that can be plugged into any of the alternator or distribution circuits. Fuel oil is pumped from tank cars to two storage tanks near the plant having a capacity of 32,000 gallons. Fuel from this central storage is metered to individual engine tanks. Each engine has its own direct measur-

. . . . *And now please turn to page 44*

FOR TOUGH JOBS RELY ON DIESELS

Right — In the farm field, where at least 1000 hours work per year per tractor is called for, International Harvester's 35 hp. Diesels are having a record sale on the West Coast this year. This McCormick Deering TD-40 Diesel Tractor is pulling a No. 33 disk plow. Owner — Daugherty & Harris, Santa Ana, Cal.

Right Center — A pair of McCormick Deering PD-40 Diesels turning out 80 tons of material per hour on a job near Yellowstone National Park. These Diesels replaced two 75 hp. gasoline engines on this job at an 8000 feet altitude, and the cost came down from \$5.00 per day per unit to about \$1.00. Owner — W. C. Burns, Idaho Falls, Idaho.

Below — A one-yard shovel operated by N. Fioreta, Seattle road contractor. It is on a paving job in Seattle, the owner changing from gasoline engine to a McCormick Deering PD-40 Diesel for reasons of economy.

Below Center — Tests by the Pacific Logging Congress showed a fuel cost differential between gasoline and Diesel tractors of 5 to 1 in favor of the Diesel. This is one big reason why this TD-40 McCormick Deering Diesel tractor is being operated for about \$1.00 a day by the Matheny Logging Co. in Oregon.

The "Luna," second tug in foreground, helping to dock the "Roma."

FLOATING POWER PLANTS

By FRANK M. PRENDERGAST

A GROUP of engineers and officials of a large towboat company were seated about the office of the general manager. From the windows overlooking several miles of waterfront the harbor presented a scene of busy activity. Tugs, ferries and small craft criss-crossed in every direction. Out beyond could be seen passenger liners and cargo ships waiting to be docked.

An important decision was to be made that day in the general manager's office. Business had been growing steadily. So had the size of vessels. For 73 years the company had been serving shipowners from every port in the world and during that time had built up a name and reputation worthy of being upheld.

Pressed for the need of additional equipment, the company faced the problem of selecting two more tugs able and powerful enough to maneuver and tow the larger vessels under their charge. The company already had thirteen steam tugs in operation. What would the new ones be? The traditional steam? Or the newer Diesel? Finally the decision came forth.

Diesel-electric.

That was five years ago this month. The company that made the decision was the Boston Tow Boat Company. The two new units built as a result of that decision were the Diesel-electric towboats *Luna* and *Venus,* today the pride of the Port of Boston.

Why? Because they vindicated the combined judgment of the company's executives and engineering staff—namely that better performance and lower operating cost were far more important factors in buying new tugs than initial cost was.

Today, after five years of acid tests and accurately kept records the facts are proved beyond the possibility of dispute.

Floating power plants — that's what their captains call them.

Every basic requirement for perfect towboat service — that's the verdict of their owners stated in writing.

Shortly after the *Luna* had been placed in commission a Great Lakes steamer bound out from Boston after delivering a cargo of automobiles, through an error in reckoning ran afoul of the dreaded Graves and with a jagged hole in her steel bottom was reported sinking off the Graves Light. A Coast Guard 125-footer, first to her rescue, immediately radioed for the *Luna* stating that she was powerless to aid the steamer in such shoal water. Just ten minutes after casting off her lines the *Luna* arrived on the scene, made the steamer fast, and despite her sinking condition, fires extinguished and listing badly, managed to tow her quickly enough to Deer Island where she was beached in safety and later salvaged.

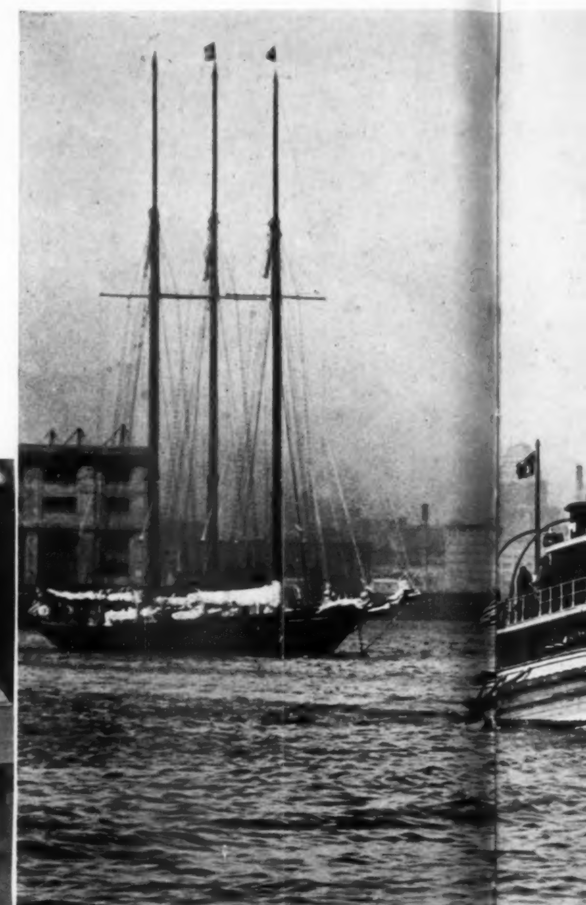
A year ago last winter when ice to the thickness of 22 inches formed in the channel of Fore River and threatened the shutdown of the stills in the big Cities Service refinery since tankers could not get in and unload their oil, the *Luna's* sister tug, *Venus,* forced a channel by bucking her rugged hull full force through the thick ice and then kept the channel open during the entire period of sub-zero weather, the coldest New England had experienced for 36 years.

Responding to a fire call one night last fall, the fireboat *John F. Dowd* went fast ashore on a mudbank in Boston Harbor off East Boston. In less than two minutes after the fireboat's distress call had been received the *Venus* was on her way to her, and inside of a half an hour had her off into deep water again and was back at her berth.

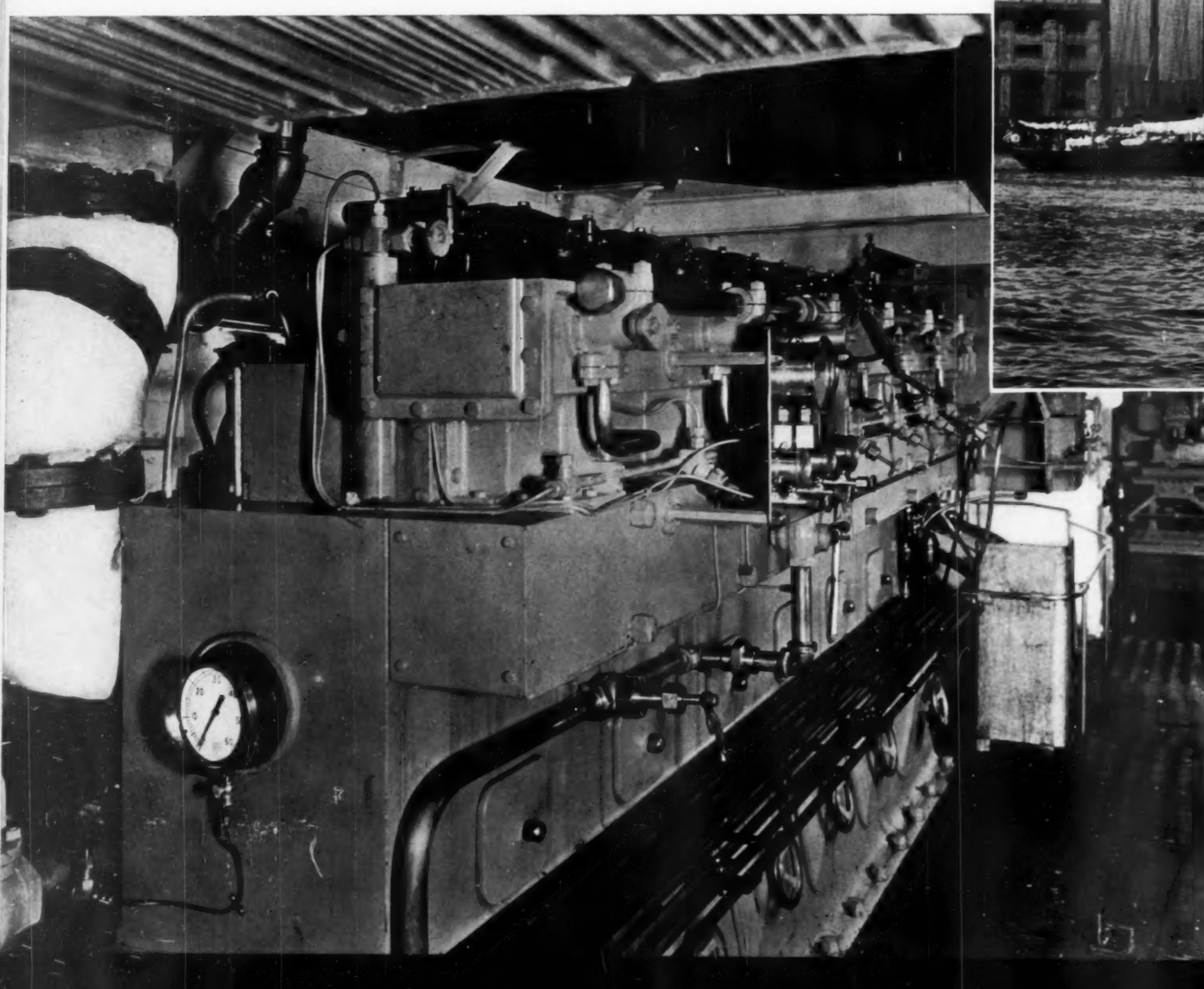
When there is a real important job to be done or when an emergency task arises captains and shipping offices no longer call for "a tug." They *specify Luna* or *Venus.*

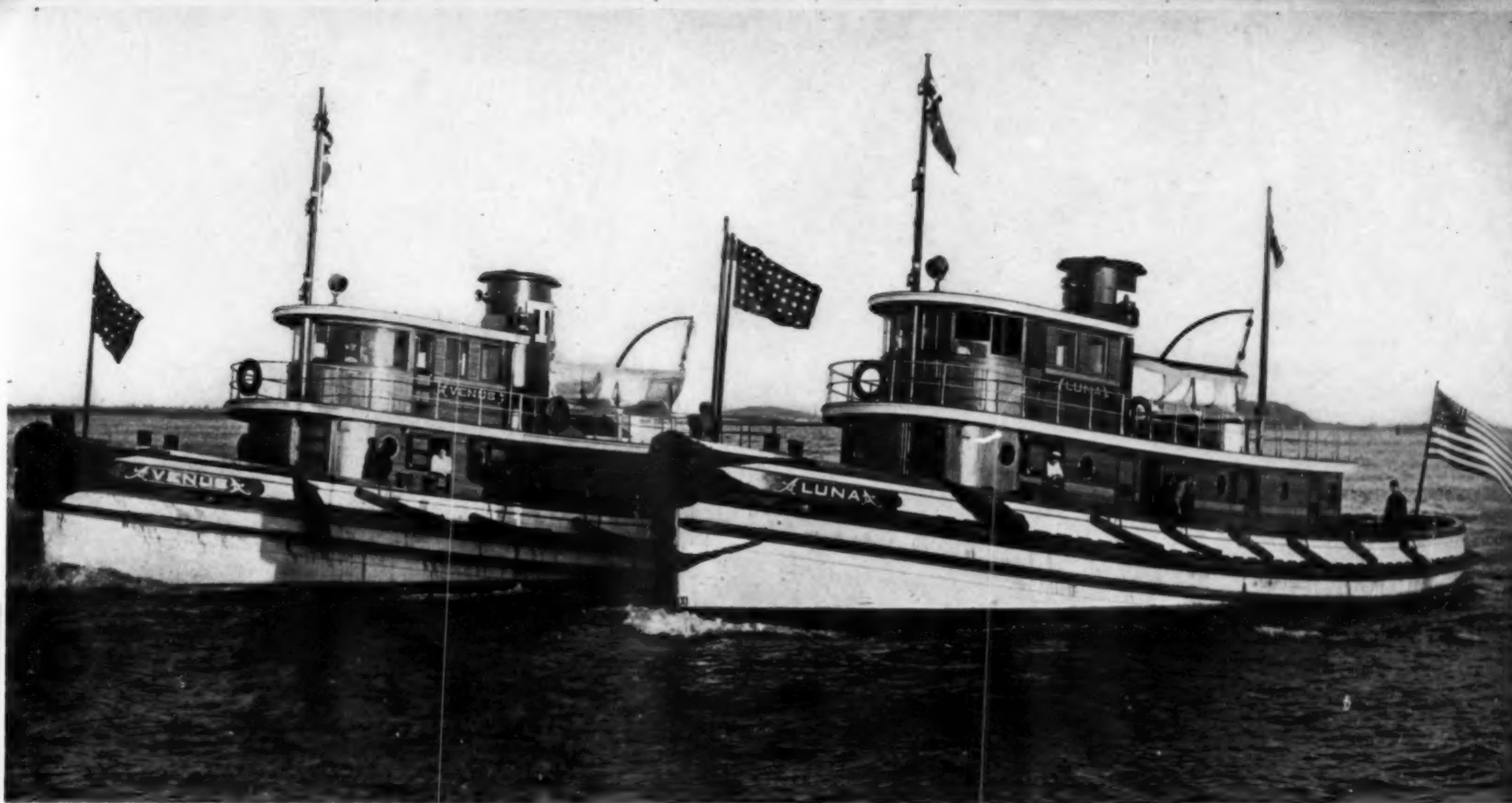
It is no exaggeration at all to state that these two Diesel-electric tugs of the Boston Tow Boat Company have made shipping history. A giant new liner makes headlines through its

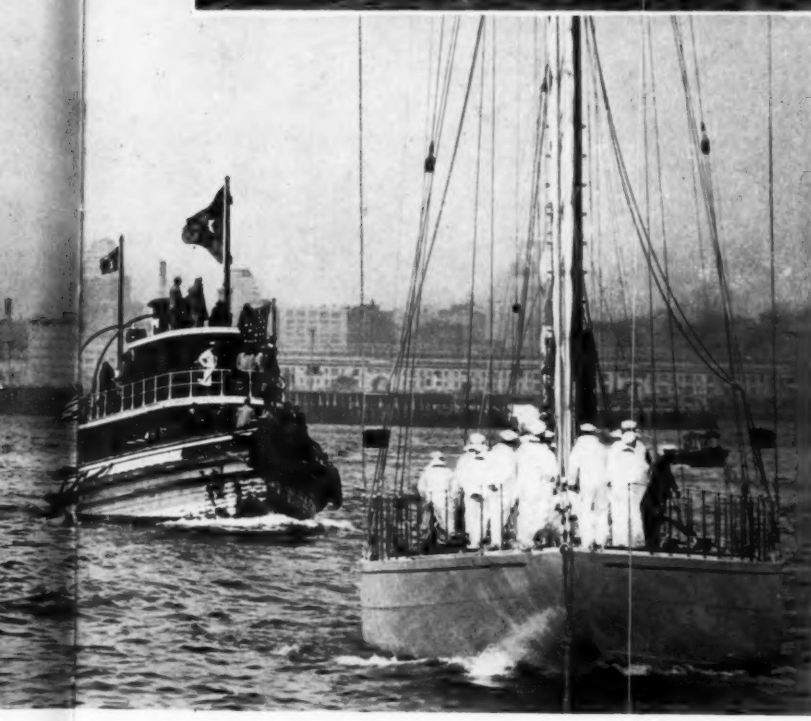
The "Luna" convoying the cup defender "Yankee."



One of the two Winton Diesels installed in the "Venus."







Running their twin Diesels at full capacity, the "Venus" and "Luna" can operate for 24 hours on a consumption of only 390 gallons of fuel for each boat.

sheer size, luxurious appointments and speed, but these Diesel towboats, far from anything spectacular in their makeup have won fame by their titanic power and agility. Yet it's all in the day's work.

Here's what Commander L. J. Gulliver, U.S.N. in command of the Frigate *Constitution* wrote the Boston Tow Boat Company on his departure after visiting Boston during a tour of United States ports with the historic ship.

"The Diesel-electric towboats, one of which was lashed to the *Constitution* in her passage from President Roads to the Navy Yard on May 7th impressed me and our officers most favorably by reason of their maneuverability and their almost instantly applied horse power. We had opportunity of observing tugboats of all kinds, sizes, ages and descriptions on the East and West Coasts and the Gulf, in rivers and channels in *ninety ports,* and we have seen none that appeared of equal qualifications in the highest sense of the word that belonged to your towing vessels. I was especially impressed with the almost perfect control that rested so easily in the hands of the tugboat captain.

"This control included the symmetry of steering quickly, changing directions quickly, and coming alongside with neatness and dispatch in such a way that even the frailest vessel to be towed could not suffer any injury."

Power, unfailing power in every emergency, plus perfect maneuverability is what the shipping world demands these days in a tug where valuable ships are concerned and first-class passenger service is involved. In docking a 15,000 ton ship, minutes and seconds count. Power failure at a critical moment when wind and tide imperil the docking of a big ship can easily spell disaster to ship, tug, or pier — or all three, with consequent damage suits running into big money.

Tugboat Annie may get the *Narcissus* and her tow out of a tight jam with an antiquated power plant but that happens oftener in stories than it does in daily life. Up-to-date towboat companies depend on engineering . . . . *And now please turn to page 46*

DIESEL S
DRAG L

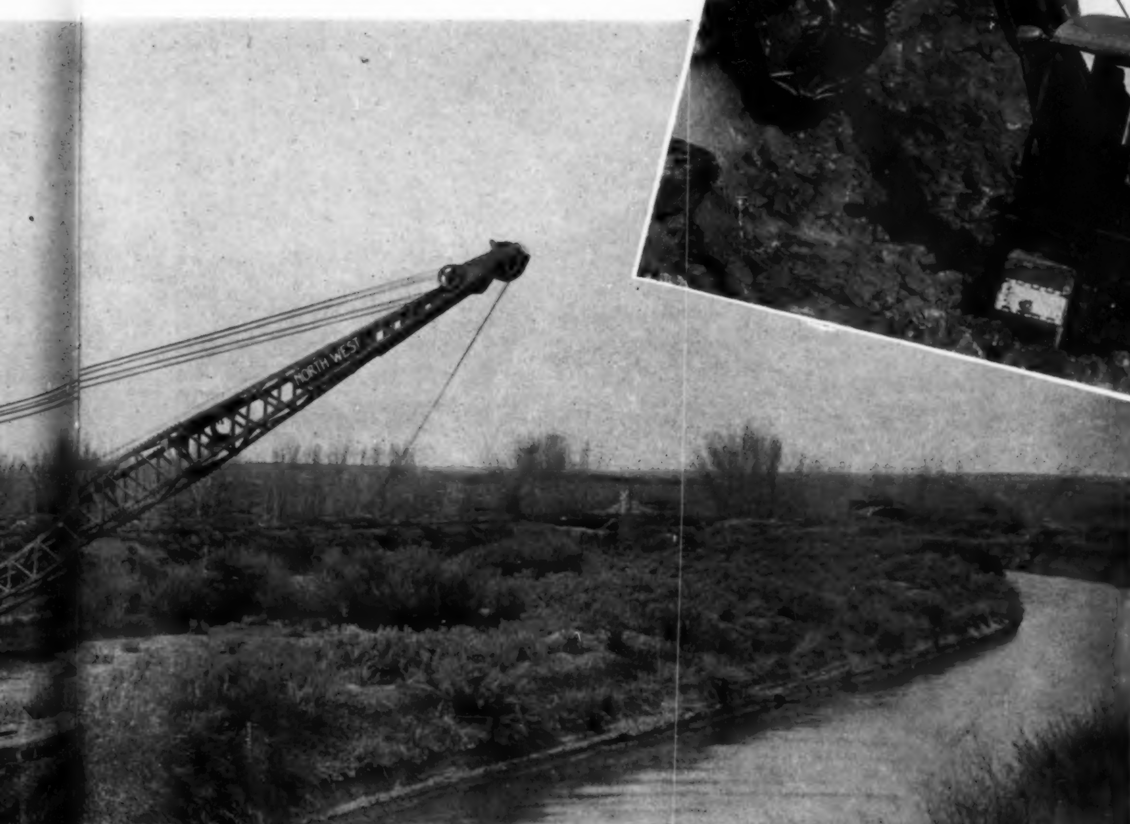
Top left — On the All-American Canal near the Mexican border in California, this pair of giant Bucyrus Erie Monigans swing 12- and 10-yard buckets. They are powered with 450 hp. Fairbanks, Morse Diesel engines and owned by the W. E. Callahan Construction Co.

Above — Working on the new Skyline Highway, Va., this 1 1/2-yard Lorain-77 shovel is powered by a Caterpillar D 11000 Diesel. The shovel works 12 hours daily with a fuel consumption of 3 2/3 gallons per hour. Contractor — Sammons-Robertson.

Above left — A 37-B Bucyrus Erie shovel powered by a Caterpillar D 11000 Diesel working on the Bear Creek State Highway near Morrison, Colo. The Gordon Construction Co. of Denver finds that the rock is tough going, but the shovel handles most of it without blasting.

On the excavation for the Kanawha Valley Power Co.'s hydro-electric plant at London Locks, a 1 1/2-yard Lorain-77, powered with a Caterpillar D 11000 Diesel, is used both as a shovel and drag line. Diesel unit fuel cost about $3.00 in 14 hours. Gas unit for the same period was $12.60.

L SHOVELS AND
G LINES



Above — One of four Lima Type 701 shovels owned by Spillway Builders, Inc., Kansas City, Mo., doing the excavation for the spillway at Ft. Peck, Montana. This machine is equipped with a Superior 5 cylinder YG-1 Diesel engine.

Left — Northwest Dragline equipped with 45'-Boom and 1 3/8-yard bucket powered by "Caterpillar" D 11000 Diesel cleaning main canal on lower Yellowstone Project. They moved 100 to 150 cu. yds. per hour on a fuel consumption of approximately 3 gallons per hour.

THE COMET MAKES R

Diesel Equipped New York, New Haven and Hartford streamliner makes the 157-mile run between Boston and New Haven in 143 minutes and the 44 miles between Boston and Providence in 32.35 minutes.

SPACE gives way to speed, and today passengers on the New York, New Haven and Hartford streamlined *Comet* find that Providence is as handy to reach from Boston as many of the Boston suburbs. The *Comet* is designed to meet particular New England conditions where distances are relatively short and traffic is dense on the 44-mile run between Boston and Providence. This section of the railroad is one of the most important of the New Haven system, so the railroad management chose it as the location for operating this newest of trains.

Built by the Goodyear-Zeppelin Corp. of Akron, Ohio, at a cost of $250,000, the *Comet* was constructed with the precision of a Swiss watch, and embodies many of the latest improvements available to railway engineers.

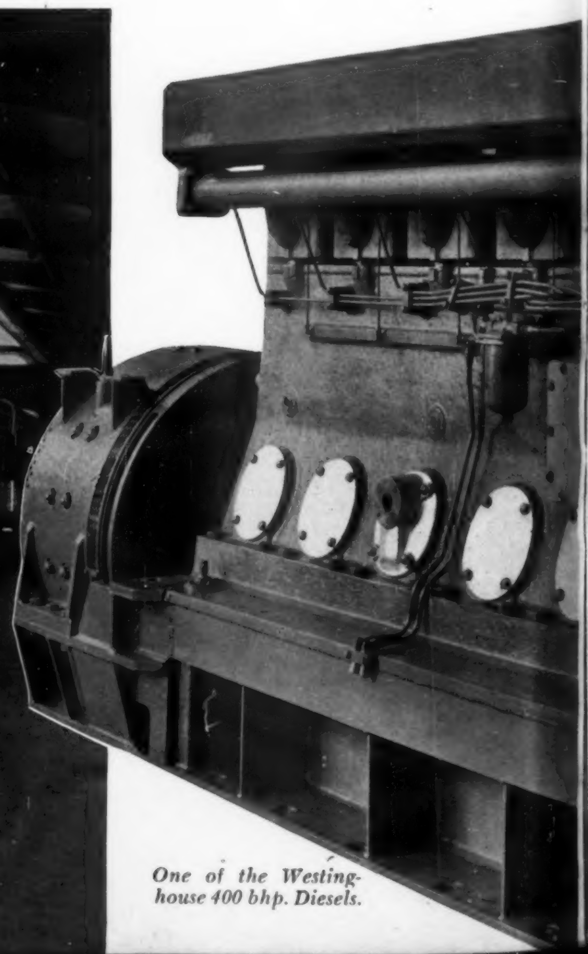
There are engines in both end-cars of the train, making it unnecessary to take the train out into the yards at either end of its trip to turn it around. Both engines are operated simultaneously by a master control, and after the engineer or motorman settles himself in his seat he adjusts the necessary controls and the train slips out of the station on its 44-mile journey. After the run has been completed, the motorman sets his controls, walks to the other end of the train and after receiving the proper "go" signal, starts on the return trip.

The power plant consists of two Westinghouse Diesel engines, one located in each end of the train. These are 400-hp., six-cylinder engines, weighing approximately thirty pounds per hp. Each Diesel engine drives a generating unit which consists of a main and auxiliary generator. Both engines normally will be in operation and are necessary to enable the train to make the required speeds and to maintain its regular schedules, but in case one of the engines stalls, the other will furnish sufficient power to run the train at a speed of about seventy miles an hour.

The two Westinghouse engines are four-cycle single acting, solid injection type Diesels, rated at 400 bhp. at 900 rpm. They are known as type 4-E and have six cylinders size 9″ x 12″. Efficiency: Obtain 0.42 pounds per bhp. hr. at full load and as low as .39 at partial loads. Weight per hp. is as low as 24.2 pounds per hp. without bedplate and 29.5 with bedplate.

The *Comet* is 207 feet long, 9 feet 10¼ inches wide and 10 feet 11 inches high, except the engine room which is 11 feet 3 inches high. The bottoms of the cars are but 10 inches above the rails. The two end cars, containing the power units in the forward sections, are each 74 feet 2 inches long. Each of these cars has coach compartments back of the engine rooms and

New York, New Haven and Hartford's streamlined "Comet."



One of the Westinghouse 400 bhp. Diesels.

S RECORD TIME

seats forty-eight passengers. The center car, which is 58 feet 8 inches long, seats sixty-four passengers, or a total seating capacity for the train of one hundred sixty. The interiors of the cars are of ordinary width, eliminating all feeling of crowding seats and narrow aisles.

The train is a three-car articulated unit equipped with a special air conditioning system. Ready to run, it weighs approximately 126 tons, which is 40 per cent less than a conventional steam-train of equivalent passenger seating capacity.

For the interior lighting, not a single light fixture is visible, the effect being of a shadowless traveling parlor. The lamps are hidden in troughs which run full length along each side of the car above the air conditioning outlets. The troughs are made of aluminum alloy and the inside is covered with a special, highly reflective but softly diffusing aluminum sheet. The light is further diffused and distributed from the ceiling, which is finished in ivory enamel and there is but very little absorption of light and no unpleasant glare or shadows.

The seats are deep cushioned, extra wide, and set low enough to eliminate the need for footrests. They are upholstered in a closed-loop rust-colored mohair.

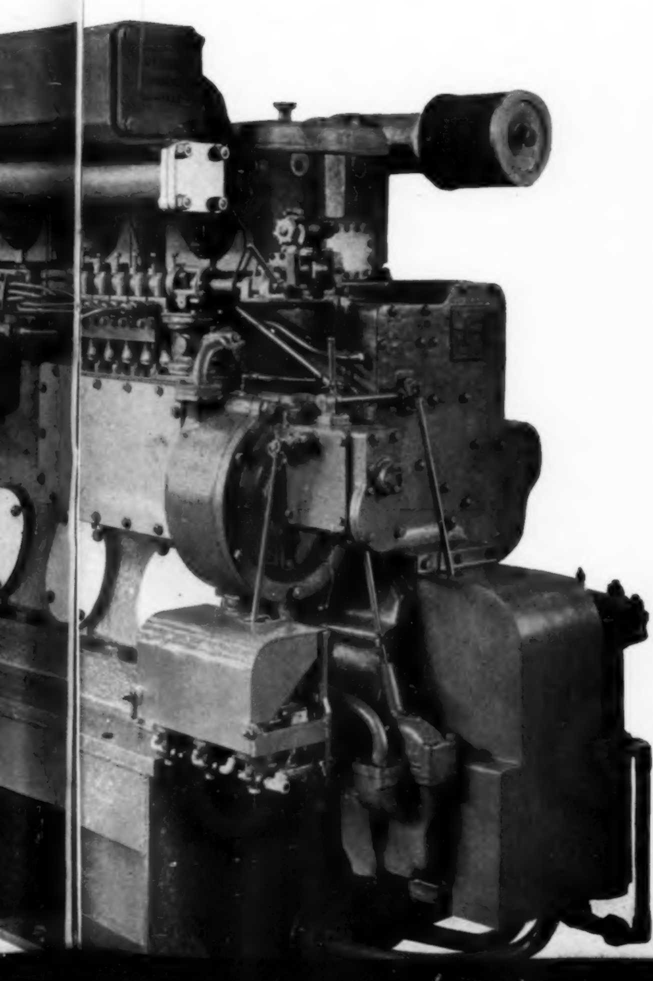
At every seat is a wide-visioned window equipped with an easily operated draw curtain for the convenience of the passenger. The window sills or caps are of a Bakelite veneer and will resist burning or blistering by cigars or cigarettes.

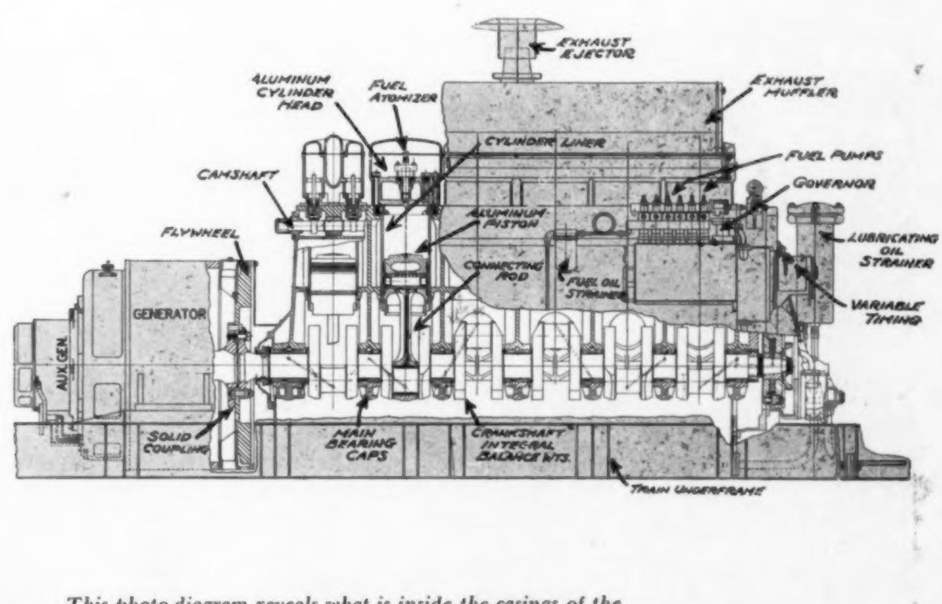
Tan is the predominating motif of the car interiors, ranging from the delicate tint of caenstone for the ceiling to a real brown for the rubber covered floors. The walls from the heating duct to the window sills are a dark tan, a medium tan for the panels between windows and light tan behind the baggage racks. In general, the interior architectural scheme is a well-thought-out design with each individual part a necessary harmonious element for utility and beauty.

In exterior appearance, the streamlining is accentuated by alternate wide bands of brilliant blue and shining aluminum, extending the entire length of the train. The roof is finished in gray enamel and above the windows is the first wide ribbon of bright aluminum. The window panels themselves are finished in ultramarine blue enamel, tying all the windows together in one unbroken line. Beneath them is another wide band of aluminum.

The success of the operation of this train will probably influence the New Haven management to purchase an additional train for similar operation between other large New England cities where the density of traffic is unusually heavy. It may also change the ideas of the management about passenger operation and bring about a new method of handling local passenger service.

In addition to this new high speed train, the New Haven has speeded up other passenger service, particularly its New York to Boston and other through trains, as well as generally speeding up its freight service. Just another example of where Diesel operation has again speeded up railroad schedules.



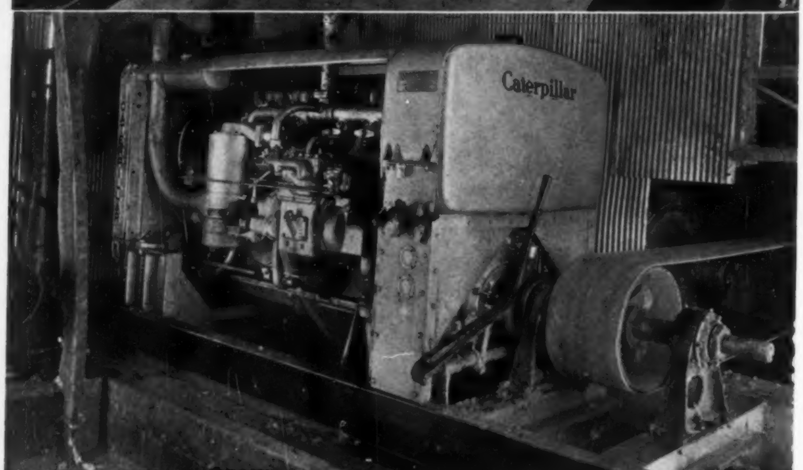


This photo-diagram reveals what is inside the casings of the Diesel engines of the New Haven's new "Comet" and gives you a good idea of the working parts and how they function to spin a generator that supplies electricity to motors geared to the axles of the car trucks.

IN COTTON GINS AND PUMPING PLANTS

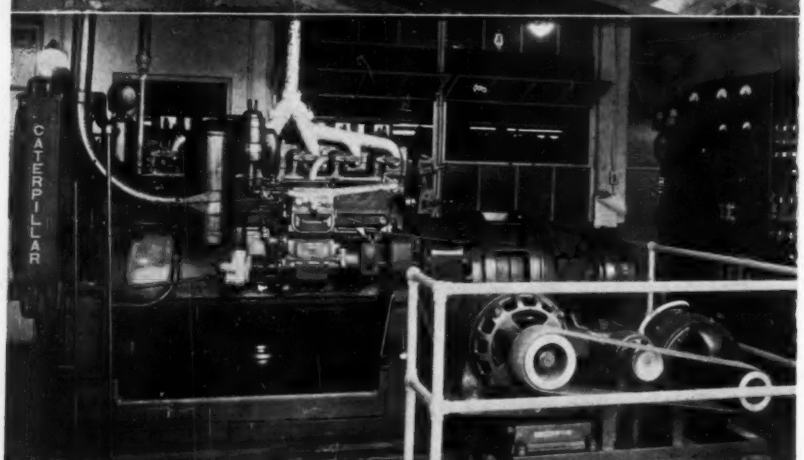
1. IN SOUTH AMERICA

Three Caterpillar Diesel power units drive these three Cameron pumps at the Rio Dagua pumping station, Buenaventura, Colombia, South America. A dependable, economical power plant consistently delivering an efficient service.



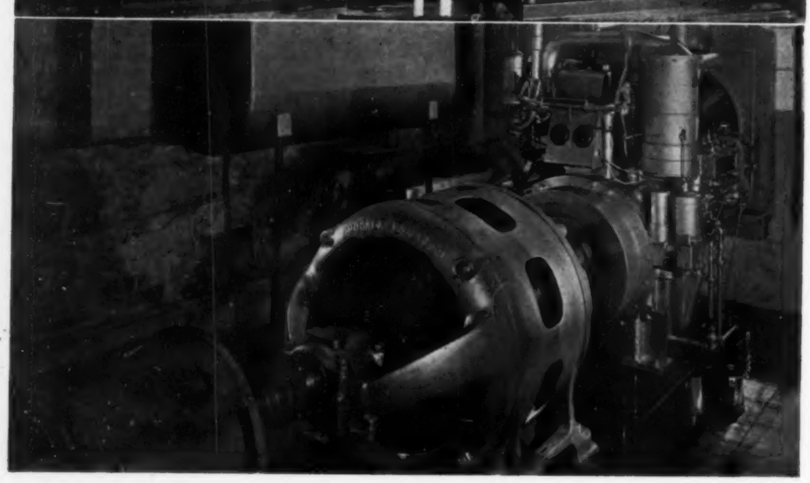
2. GINNING COTTON

Steam, electricity and Diesel power—how do costs compare? Let Mr. Shaw tell you what happened to the power costs of the Shaw Gin & Commission Co., Cartersville, Ga. "In all, I am operating seven gins, four with electric power, two with steam and one with a Caterpillar Diesel power unit. An accurate check on power costs for these different units shows the following astonishing results, figured on the power costs per bale of cotton ginned: Twelve cents a bale for Diesel power—fifty cents a bale for electric power and seventy-five cents for steam." This Diesel plant adds sixty-three cents profit for every bale of cotton that was formerly ginned by steam, thirty-eight cents to every bale ginned by electricity. Mr. Shaw is right, the results are astonishing.



3. A 100 HP. UNIT

A Diesel generating plant adaptable to thousands of power using requirements. A six-cylinder 102 hp. Caterpillar Diesel direct connected to a three phase, 240 volt, 62.5 kva. General Electric generator.



4. AT OSSINING, N. Y.

Cambridge Instrument Co. are saving real money with this Caterpillar Diesel generating unit. A 25 kw. set. This plant has produced over 6000 kw. hours of current at a fuel and lubricating cost of $.0086 per kw. hour on an average load of 13 kw. operating on 28 degrees Baume fuel oil at 6c per gallon.

Above—For road construction in mountainous country, the Youdall Construction Company and Chas. Harlowe, Jr., of Crescent City, Cal., are using two Cletrac "80" Diesels and two 12 cu. yd. LeTourneau Carry-All Scrapers.

Top—Model 35 Diesel Cletrac discing on the farm of A. B. Kennedy, Santa Clara, Cal.

Right—Logs scaling approximately 6,000 feet are hauled down 45° grades by this model 80 Diesel Cletrac, which is used for pan skidding logging by G. W. Bouton, Concrete, Wash.

Left—Starting down a 30% grade with a load of logs behind a model 80 Diesel Cletrac and a Carco Yarder.

Economy of operations and ability to handle a tough day's work have made the selection of Diesels predominate for log hauling, road construction and large acreage farming.

MORE POWER • LESS COST

SINGER BUILDING POWER P

It has never been allowed to grow old

ONE of the most outstanding Diesel installations ever made in this country, possibly in the world, is the one just completed in the Singer Building Power Plant at 149 Broadway, New York City. Details of this unique installation, with the reasons why it was made, are given on the following pages by Mr. Stanley F. Davies. Consulting Engineer.

The Singer Building is regarded as the father of all tower type office buildings because it was the first of its kind. At the time of its construction the many problems encountered and successfully solved in its erection attracted worldwide attention.

The original group of Singer Buildings on Liberty Street and Broadway were erected in 1896 from designs by the well-known architect, Mr. Ernest Flagg. In 1905 Mr. Flagg was commissioned to re-design the group and add the Singer Tower. Work on this new grouping began in 1906, and the Tower itself was completed in 1908.

The original power plant of the Singer Building consisted of water tube boilers totaling about 2,000 hp., which operated five Corliss type engines.

In 1920, keeping abreast of the times, the first large oil burner installation was made in the power plant of the Singer Building. The use of fuel oil began on June 1, 1920, and from then until June 30, 1922, the average saving was 34 per cent better than if No. 2 buckwheat coal had been used. The saving represented the total cost of the installation plus 12.2 per cent interest on the investment, or in other words, the installation paid for itself in twenty-one months.

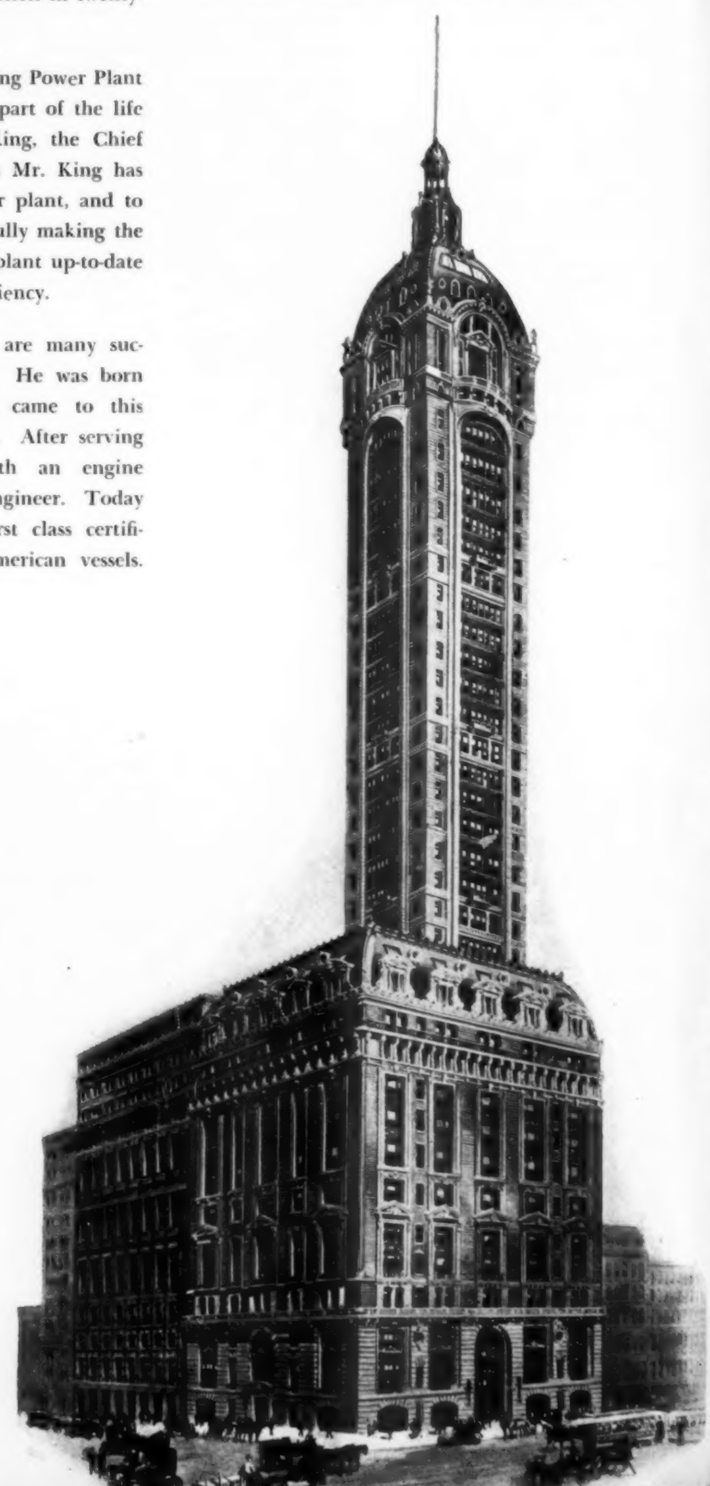
The history of the Singer Building Power Plant is tied in with and becomes a part of the life history of Norman McLeod King, the Chief Engineer. For thirty-two years Mr. King has been connected with this power plant, and to him goes the credit for successfully making the necessary changes to keep this plant up-to-date and at its highest possible efficiency.

Mr. King is a Scotchman, as are many successful power plant engineers. He was born in Glasgow March 21, 1876, came to this country at the age of fourteen. After serving five years apprenticeship with an engine builder, he went to sea as an engineer. Today he holds Marine Engineers first class certificates for both British and American vessels.

In 1903 he joined the Singer organization as assistant chief engineer, and became chief engineer fifteen years ago.

When the old Singer Power Plant was removed in 1906 Mr. King was responsible for the erection of the new one and the installation of many improvements and the modernizing of the equipment. At that time this plant was considered ten years ahead of

Stanley F. Davies of Kaiser, Muller & Davies, Consulting Engineers on the design and erection of the Diesel power plant in the Singer Building.



R PLANT

anything of its kind, and it has now been in continuous operation for twenty-six years. It contained one of the first welded steam pipe lines and operated one of the first set of traction type elevators.

Keeping step with his progressive policies, the most recent improvement to be made entirely on Mr. King's recommendations to the building management is the installation this year of a six-cylinder 525 hp. Winton Diesel engine. This engine is being used to drive a Diehl 350 kw. generator, which carries the lighting and elevator load either alone or in combination with the other power plant equipment. Already, in the very short time it has been operating, this addition to the plant has confirmed Mr. King's prediction that it would prove more economical and efficient than the equipment it replaced.

It can truly be said that "The Singer Power Plant has never been permitted to grow old."

The primary reasons for installing this Diesel engine were to reduce the yearly cost of generating electric current by the building power plant and to be able to discontinue the public service breakdown.

Norman McLeod King, Chief Engineer, Singer Building Power Plant.

For a number of years, Mr. King had realized that the increasing electrical load on the generating plant was resulting in larger heat losses in the form of exhaust steam being discharged to the atmosphere and that the rate paid per kilowatt hour for the electrical breakdown service was considerably more than the plant rate per kilowatt hour.

Mr. King felt that the installation and operation of a Diesel engine driven electric generator would reduce the yearly cost of electricity and would be also a reliable unit to act as a breakdown.

Preliminary studies that he made appeared to justify the installation of a 350 kw. Diesel electric unit.

The removal of a spare boiler and a large exhaust fan at the north end of the boiler room would provide space for the installation of the Diesel unit.

Convinced that the scheme was reasonable Mr. King reported to the building management and suggested that his report and data be checked by a Consulting Engineer familiar with Diesel engine installations and operation. Kaiser, Muller & Davies were retained and their study of the problem confirmed the report of Mr. King.

It was then decided to install the Diesel engine unit at once and the Consulting Engineers were instructed to prepare specifications and plans for bids.

The main features of the installation that are of interest are briefly outlined below.

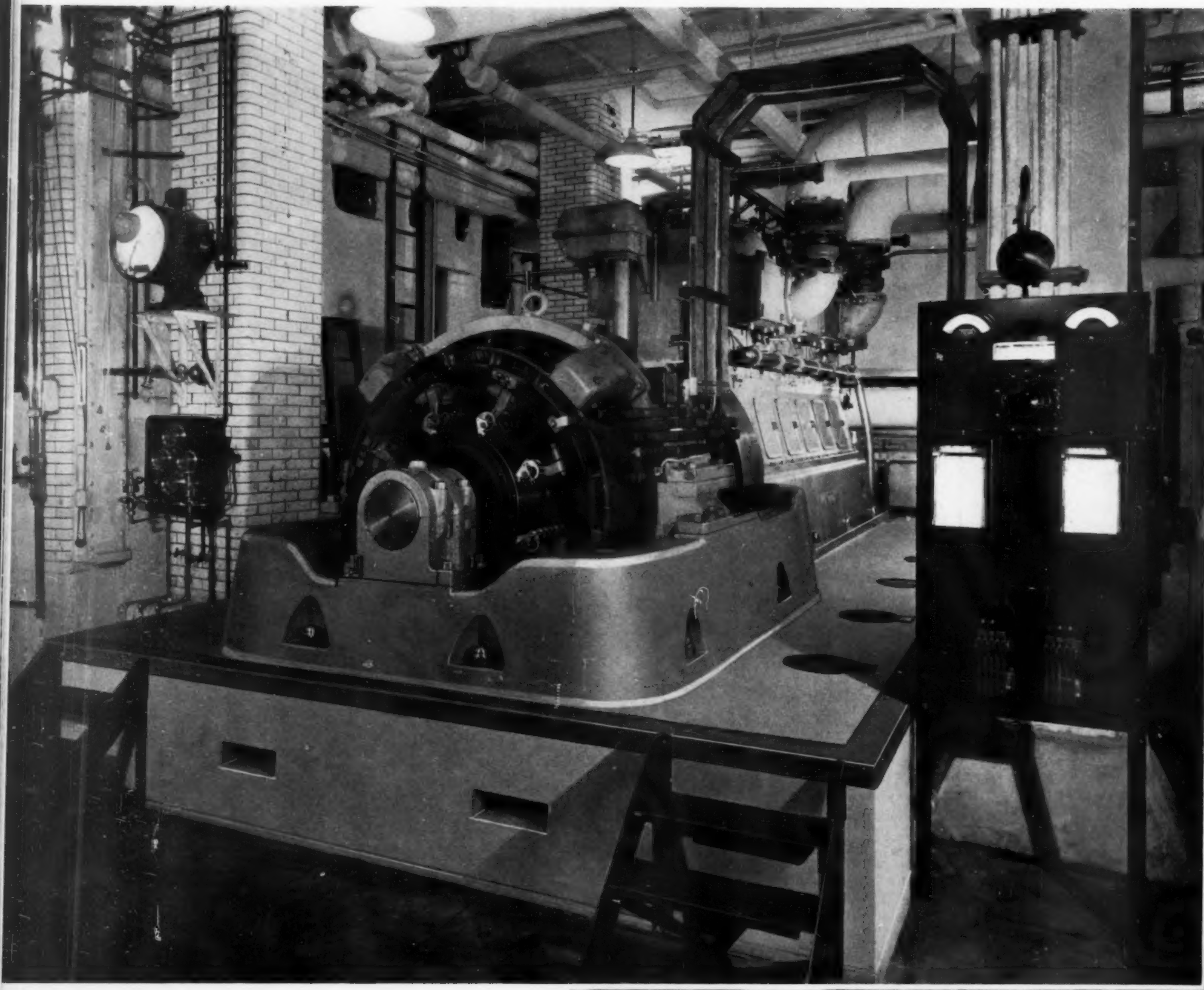
The Winton Diesel engine is a six-cylinder, 14" x 16", four cycle, solid injection machine, rated at 525 bhp. at 375 rpm.

The Diehl generator is rated at 350 kw. and is of the compound wound, interpole, direct current, two wire type, designed for normal operation at 240 volts.

The engine and generator are mounted on a common rigid box type base that is 24 inches high so as to insure good shaft alignment

One of the problems that had to be given serious study was the foundation and the means to be used to isolate the normal engine vibrations from the building structure.

That section of the building in which the Diesel unit had to be located is built on a raft or mat type of foundation where the top of the concrete mat is only a few inches below the boiler room floor. That condition required the Diesel unit foundation to be built entirely above the floor of the boiler room and further required that the foundation be limited in depth to only two feet if proper head room was to be obtained for the removal of the pistons and liners of the engine.



General view of 525 hp. Winton Diesel installation in Singer Tower, showing 350 kw. Diehl generator in foreground.

To the right — Side view of the Winton Diesel and a part of the spring base, showing five of the six springs used on each side of the engine foundation.

The illustrations appearing in this article were taken prior to the erection of the railing around the engine and before the engine was enamelled and all painting of the accessories, etc., was completed. On completion this will be one of the most beautifully finished Diesel installations in the country, comparing favorably with the outstanding Winton power plant in the General Motors Building at the Chicago World's Fair.

After carefully considering the use of cork, rubber and steel springs as the vibration isolating medium, it was decided that spring suspension would be the most positive means of preventing the transmission of the engine vibrations to the building.

Steel springs have been used for years to isolate machinery, their performance can be quite accurately predicted mathematically, they can be manufactured with precision and their life is long if the material is worked at relatively low stresses. A concrete mat strongly reinforced with steel bars and made with a rich mixture of cement was designed to spread the load of the Diesel unit and also to serve to hold the bed plate rigid.

The problem of supporting the mat and its load on the springs so as to keep the mat close to the boiler room floor and yet have the spring so located as to be readily accessible was neatly solved by Mr. George D. Pogue who devised an ingenious method of placing the spring in a strong steel housing that is cast into the floating concrete mat. The head or top of the housing is removable and when taken off gives easy access to the spring. The spring is compressed either by a large machine screw fitted into the head or by means of oil under pressure.

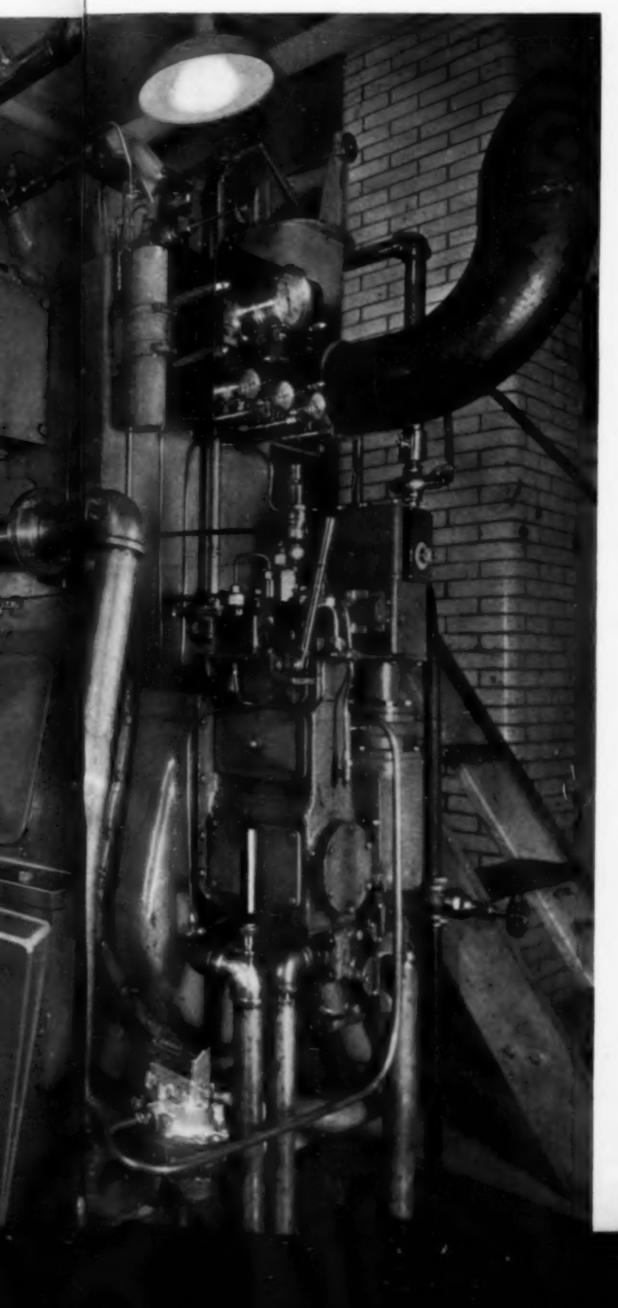
There are twelve springs, six located in the north side of the floating mat and six in the south side of the mat.

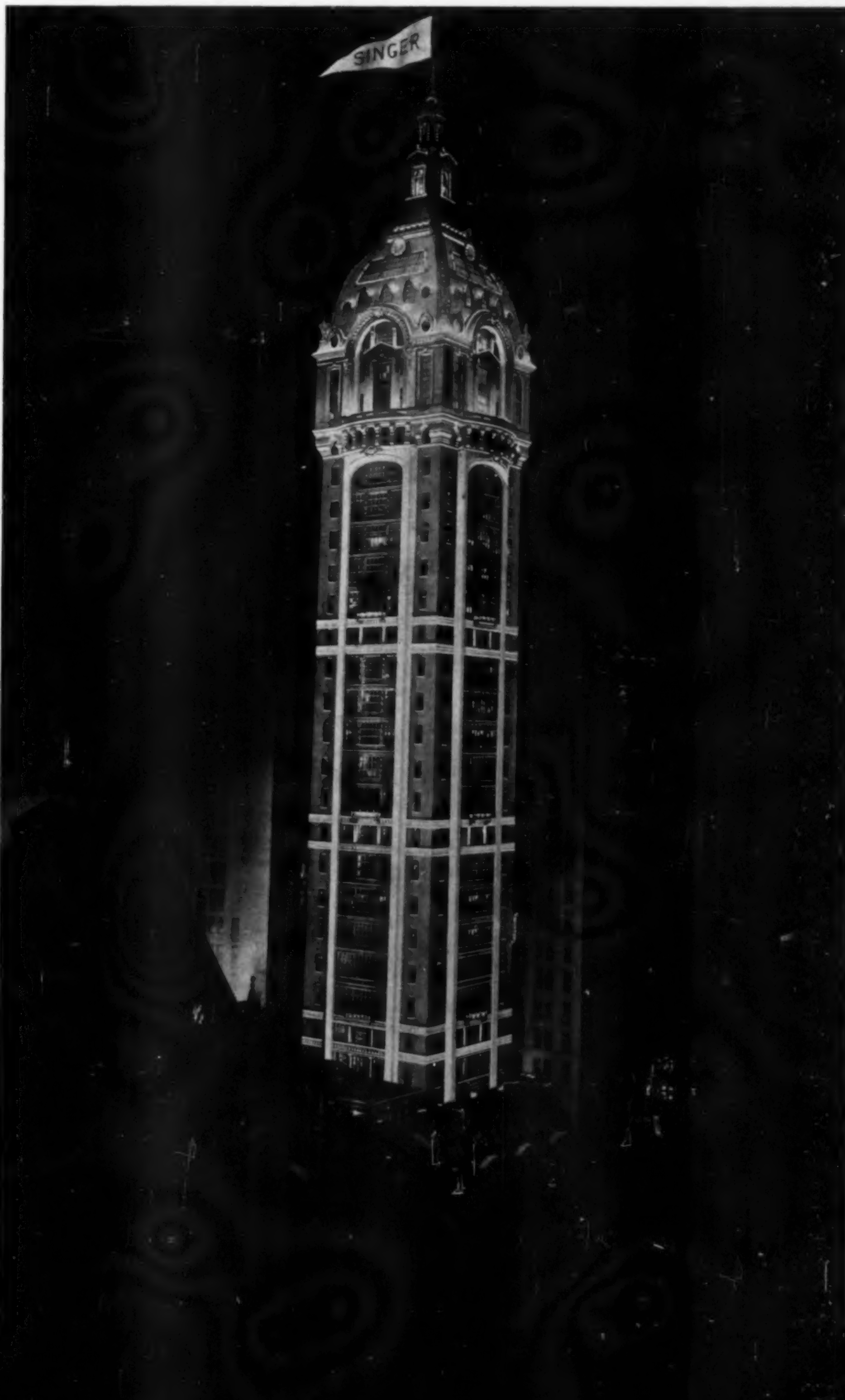
To effectively prevent the vertical forces set up in the engine reaching the boiler room floor the springs were designed for a transmissibility of one thirty-fifth (1/35). And as the frequency of the engine vibrations at normal speed is 18.75 cycles per second, a spring compression of about one inch was required. The total weight of the suspended mass (engine, generator and concrete mat) is 168,000 pounds, therefore each spring was designed to compress one inch when loaded at about 14,000 pounds.

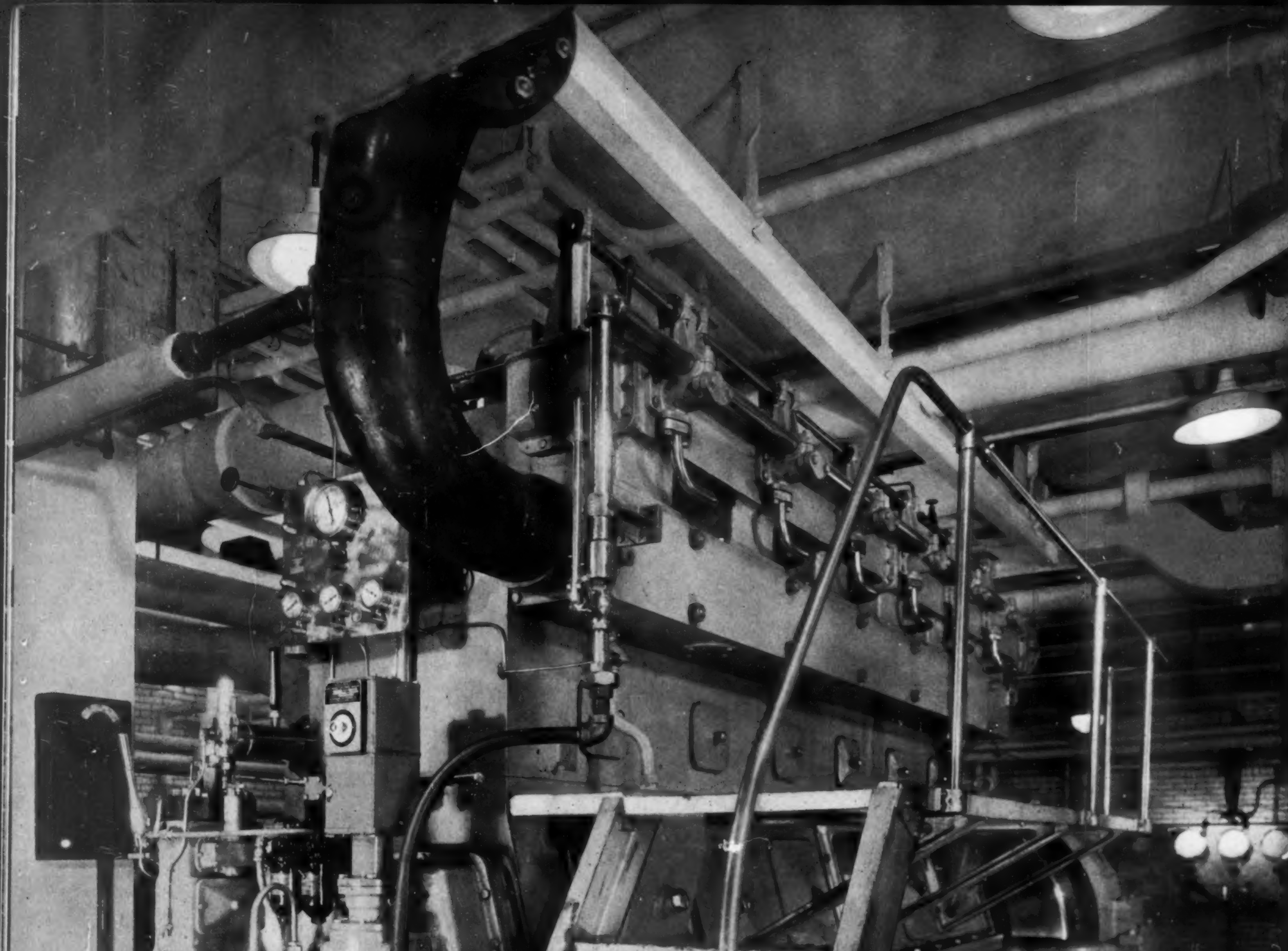
The springs were located symmetrically on each side of a line through the center of gravity of the total suspended mass and drawn at right angles to the axis of the engine shaft.

To overcome oscillations in the suspended mass at slow engine speeds when starting and stopping, due to the low frequency of the torque reactions approximately corresponding to the natural frequency of the compressed springs, a strip of special rubber was installed between the floor and the floating mat along the north and south sides of the foundation.

A 7,800-gallon steel tank that was formerly used for boiler fuel oil and located under the Liberty Street sidewalk in a separate vault is used to store the Diesel engine fuel oil.







Operating end of the 525 hp. Winton Diesel in the Singer Tower.

From this tank the fuel oil is pumped by either of two small Viking 1/3 hp. transfer pumps, through filters to a 60-gallon day tank located adjacent to the engine. From the day tank the fuel oil goes by gravity through a meter and another set of filters to the engine fuel pump.

The two transfer pumps are started and stopped automatically by the operation of a Mercoid Switch and Float on the day tank.

Two 150-gallon tanks are provided for the lubricating oil, interconnected so that either can be used as a run tank or a storage tank. Both are connected to a Sharples centrifuge which has been so piped that it can be operated as a by pass continually cleaning the oil as the engine operates or it can clean the oil in one of the tanks acting as a storage reservoir. The hot oil is pumped from the run tank through a lubricating oil cooler and then through a duplex filter to the high pressure oil header in the engine.

Pressure gauges are provided on both sides of the filters so that the condition of the filters can readily be seen.

The oil cooler is designed to pass 20 gallons of oil per minute and 150 gallons of water per minute. The oil temperature ranges between 135° F. and 150° F.

The engine jacket water cooling system has been designed to automatically keep the ingoing water at 130° F. and the outgoing water about 140° to 145° F.

A 150-gallon per minute Gould's centrifugal pump circulates the cooled (130° F.) water through the lubricating oil cooler and the engine jackets. At the outlet the hot (145° F.) water divides, part going directly back through an expansion chamber to the suction end of the 150-gallon pump, the balance going first through a heat exchanger (which raises the temperature of the make up water going to the boiler feed water heater), and then to a small indoor type cooling tower.

From the cooling tower the water is pumped by a 75-gallon per minute centrifugal pump into the discharge header of the 150-gallon pump at a rate controlled by a Taylor temperature operated valve and a hand valve. These valves are set so that the mixture of the hot water from the 150-gallon pump when mixed with the cooled water from the 75-gallon pump will deliver water to the jacket intake at about 130° F.

The Bink's cooling tower is of the spray type with drip baffles at the top. Air is forced through the tower by two fans each driven by a 3 hp. shunt motor.

The air and vapor discharge from the tower is directed by a short metal duct at the top into a large vent or flue located at the side of the boiler smoke stack. The area of the duct has been made smaller than the area of the flue thus allowing the hot air from the boiler room to also go up the flue the natural draft of which is added to the pressure of the tower fans. The large volume of hot air from the boiler room going into the flue keeps the water vapor discharge of the tower from condensing until it reaches the roof fourteen floors above.

The capacity of the cooling tower is about 90 gallons of water per minute.

It is believed by the Consulting Engineers that this practice of keeping the cooling water temperature range within close limits will result in better engine operation and less work for proper maintenance.

As this engine was installed primarily to reduce the cost of generating electric current any waste heat recovery apparatus that would show a net gain in dollars above the capital and operating charges of the apparatus would be justified.

A careful study of the operating conditions and the possible heat recovery showed that a saving of $1,600.00 per year could be made by installing a heat exchanger to increase the temperature of the boiler make up water and a Foster Wheeler exhaust gas water heater to further increase the temperature of the feed water going to the boilers.

The exhaust gases after going through the water heater are discharged directly into the boiler flue at the base of the smoke stack.

To easily regulate the volume of exhaust gases going through the water heater and to provide a complete by pass to the heater, a separate pipe was run between the engine exhaust manifold and the boiler flue. That pipe line being provided of course with a suitable silencer.

In both the exhaust pipes close to the manifold a special high temperature butterfly valve was installed, the damper shafts being coupled together with the damper set at 90°, so that by turning a hand wheel on the coupled shafts the volume of exhaust gases passing through the water heater can be easily regulated.

The exhaust gas water heater has also been provided with a steam pop valve set at 190 pounds to act as a relief should the flow of water through the heater be reduced enough to cause the formation of steam.

The air for the Diesel engine is drawn from a passage way at the south end of the boiler room where fresh cool air is always provided from openings in the sidewalk on Liberty Street.

An Annis air filter is provided at the intake end of the air pipe so located that the screens can be easily removed for cleaning.

An 8-inch Burgess silencer is also provided in the air line.

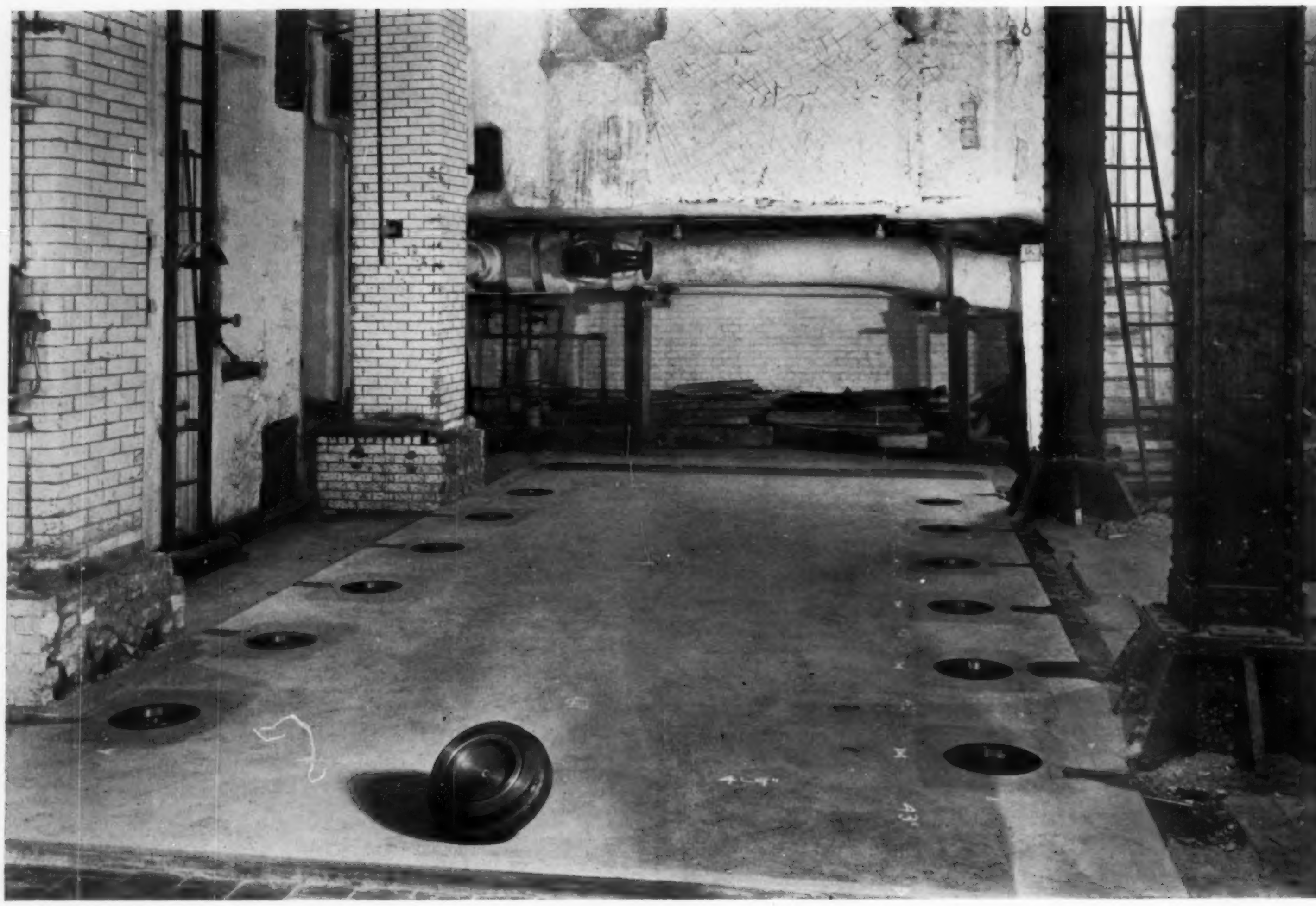
The air for starting the Diesel is stored in two 8.3 cubic foot tanks at 400 pounds per square inch. The two tanks are neatly mounted on a cradle one over the other. They are made to conform to A.B.S. specifications, were tested for 666 pounds pressure and have been provided with relief valves, drains, hand holes and gauges.

Air is pumped into the tanks by a 4¼" and 2¼" x 3½" two stage Gardner Denver air cooled compressor driven through a V belt by a 5 hp. motor. The air pressure is automatically maintained by means of a pressure start and stop contact switch functioning to operate the motor controller.

It was not considered necessary to provide a gas engine driven compressor in addition to the motor driven one, for the reason that the power circuit that operates the motor originates at the main switch board which receives its electrical energy from steam driven generators, one or two of which are normally in operation. And since the air pressure in the starting tanks is automatically maintained at all times, the Diesel engine would always have air to start should the steam plant suddenly shut down.

All the cooling water pipes and all the fuel and lubricating oil pipes (except the overflow return from the fuel oil day tank) are of brass.

The exhaust gas lines are standard iron pipes as is also the air intake line as far as the silencer. Between the silencer and the filters the air intake line is made of formed heavy galvanized sheet iron.



Base showing spring supports.

All lines connected to the engine, large and small, are provided with a length of flexible pipe to permit a certain freedom of movement and to prevent the transmission of objectionable vibration.

The engine has been provided with the usual array of thermometers and gauges in water and oil pipes. In the fuel oil line just ahead of the engine fuel pump an oil meter has been connected which when read at proper intervals with the kilowatt hour meter connected to the generator, will give the fuel consumption rate of the unit.

Each exhaust outlet is provided with a thermocouple connected to an indicating temperature meter by means of a six point rotary switch. The meter is mounted on the generator instrument board.

An electrical contact making thermometer has been provided at the jacket water outlet connected to a bell located over the generator instrument board to sound a warning should the temperature of the outgoing jacket water rise above 150° F.

A pressure operated contact switch has been installed in the main lubricating oil header on the engine and electrically connected to a bell located near the generator board to sound a warning should the oil pressure be reduced a few pounds below normal pressure.

In addition to two sets of Purolator duplex lubricating oil filters there has been provided a centrifuge having an effective capacity of 65 gallons of oil per hour. The centrifuge is equipped with a 3 kw. heater to raise the temperature of the oil to 170° F. as an aid to centrifugal clarification.

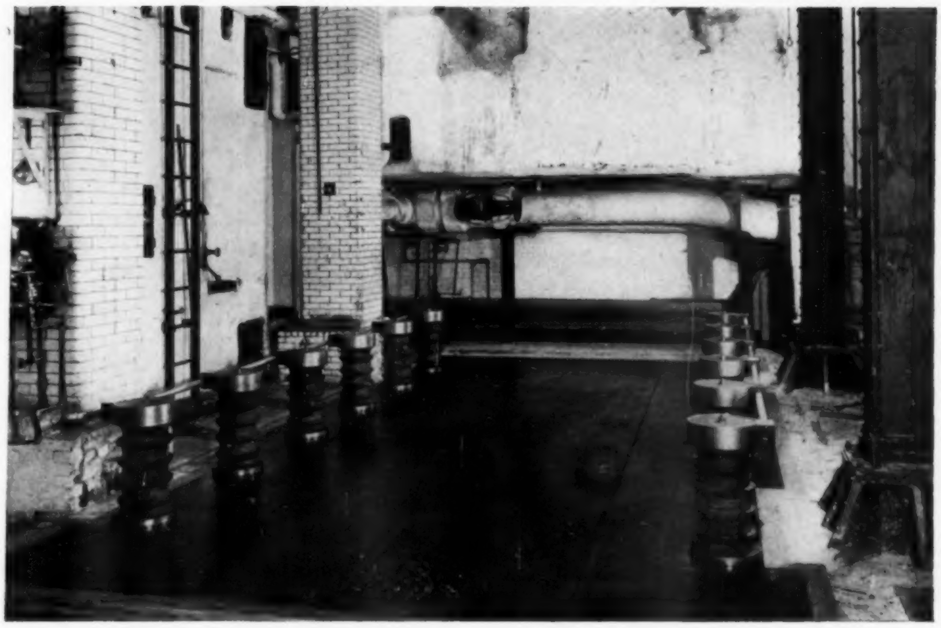
A neat hand rail 31 inches high has been provided around the edge of the foundation and platform.

The electric generator that is driven by the Diesel engine is one hundred and fifty feet (150'0") from the plant main switchboard, so to insure good parallel operation with the existing steam driven generators it was necessary to provide electrical connections between the Diesel engine generator and the main switchboard, that were low in resistance. Therefore two 1,500,000 circular mil cables were installed per leg; that is two cables for the +main, two for the −main and two for the equalizer. A No. 1 cable was provided for the field rheostat connection.

The discontinuance of the Edison breakdown service made available a panel on the main switchboard which was therefore used to mount the main switch, circuit breaker and some of the meters for the new generator.

The control of the new generator, such as connecting to and disconnecting from the main bus, and the voltage adjustments are all done at this main switchboard panel.

To provide a means of communication between the Diesel engine operator in the boiler room and the switchboard attendant in the engine room an audible visual signal system was provided. This system consists of a set of three tumbler switches, two miniature lamps (one red, one green) and a 5-inch bell mounted on the generator panel and a similar assembly of



Spring bases in position ready for forming of floating slab. Hydraulic devices for lifting slabs and engine are embodied in these cages.

equipment mounted on a panel near the west or operating end of the Diesel engine.

The switches, lamps and bells at the two locations are electrically connected to function as follows:

When the switchboard attendant wants the Diesel engine started he rings the bell located on the panel by the engine. When the engine has been started and ready for load the engine operator throws one of the tumbler switches on his panel which causes the green lights to burn at the generator panel indicating to the switchboard operator that he can put load on the generator.

When the generator has been connected to the main bus the switchboard operator throws one of the tumbler switches which causes the red lights to burn, indicating to the engine operator that the generator is "on the line." The green light is then disconnected.

Adjacent to the generator another instrument panel has been provided, to serve as a support for a graphic voltmeter, a graphic ammeter, the pyrometer and a 2000-ampere two-pole disconnecting switch. On the panel is also mounted a pull switch connected to the circuit breaker on the main board, so in an emergency the breaker may be tripped and the load taken quickly off the Diesel engine.

This instrument panel at the generator also serves as a junction point for the connecting of the main cables to the generator. The main cables terminate at the upper studs of the 2000-ampere switch and from the lower studs of the switch to the terminal board on the generator copper bus bars are connected. These bus bars have been made long so as to form an arch from the terminal board on the generator field frame to the instrument panel, for the purpose of providing a very flexible connection that will prevent the copper bars from breaking due to the oscilating motion of the engine and generator when starting and stopping.

It is the intention to operate the Diesel unit twenty-four hours per day during the non-heating period of the year and at such times during the heating period when the demand for exhaust steam from the steam driven generators is considerably less than the total building electrical demand.

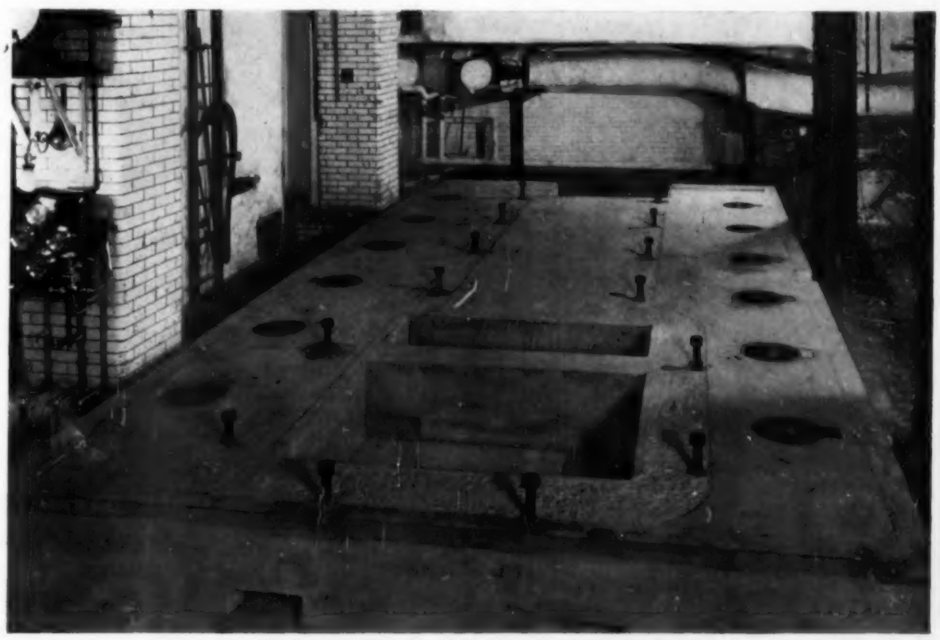
By this method it will be possible to generate by the Diesel unit about 1,180,000 kw. hrs. per year out of a total of 2,360,000 kw. hrs. and as the Diesel engine is independent of the steam boilers it will act as a breakdown reserve and will permit the Edison breakdown electric service to be discontinued, resulting in a considerable saving in dollars per year, as the Diesel unit can generate a kilowatt hour of electricity at less cost than the Edison breakdown service per kilowatt hour.

With the Diesel unit in operation less load is carried by the steam driven units, resulting in less waste of exhaust steam to the atmosphere and less make-up water to the boilers.

The recovery of heat from the Diesel jacket water and heat from the exhaust gases will also make a saving.

The total savings that can conservatively be made by the careful operation of the Diesel unit will pay the entire cost of installation (all charges considered) in about four years.

No additional labor will be required as the present engine room personnel are entirely capable of operating the new unit and making all minor repairs.

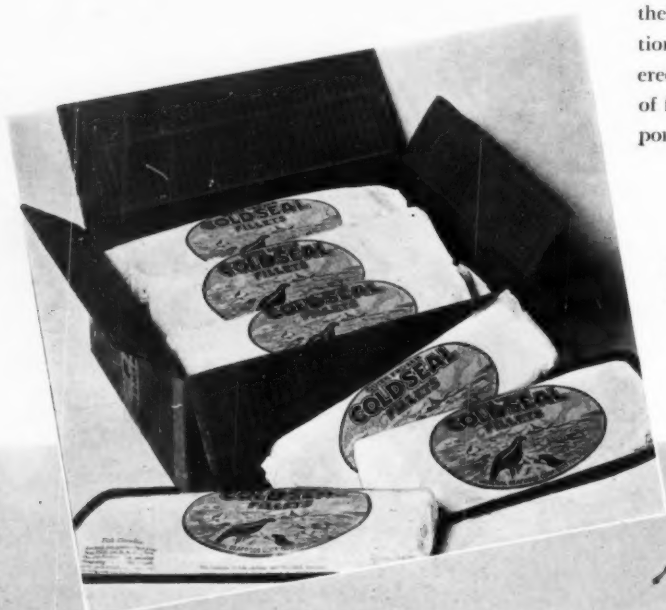


Floating slab completed ready to receive engine.

DIESELS,
FISH AND CELLOPHANE

WHEN the American housewife in the South, Southwest and Middle West decides to have fish for Friday dinner, she may be assured of fine fresh fish by purchasing Cold Seal fillets, quick frozen and packed in cellophane by the General Seafoods Corporation of Boston.

This company is able to sell and distribute the production of their fleet of seven vessels to a wide market, because of their saving in the cost of fleet operations through the use of Diesel powered trawlers and because frozen fillets of first class quality can be safely transported throughout the United States.



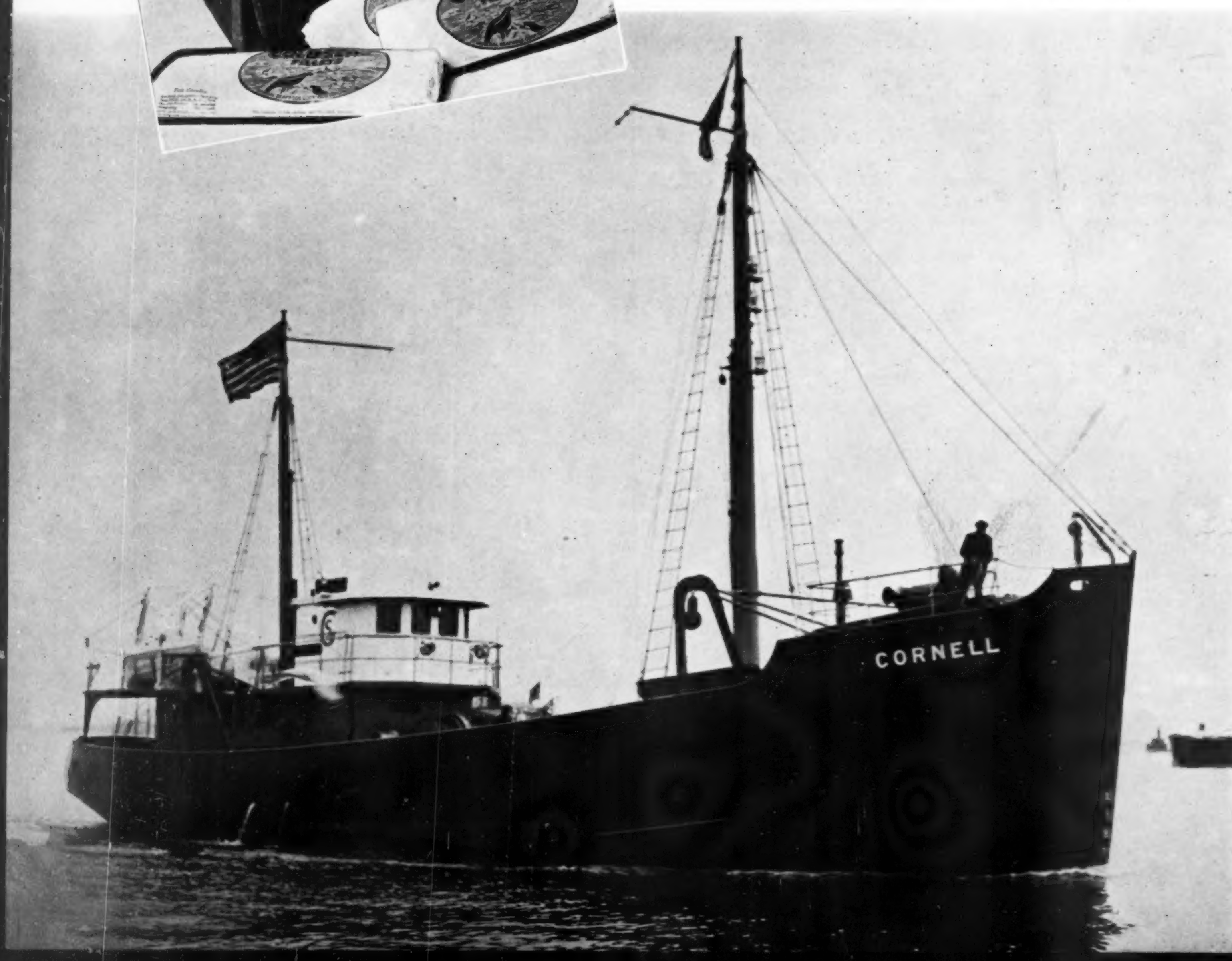
Cellophane wrapped, "Seafresh" Haddock and Cod Fillets.

The General Seafoods fleet comprises two Diesel schooners the *Exeter* and the *Andover*, three Diesel powered trawlers, the *Amherst*, the *Cornell* and the *Dartmouth* and two old style trawlers the *Harvard* and *Princeton* which are steam driven. The *Andover* and *Exeter* are sister ships, 93′3″ long, 21′6″ beam, and powered with a 230 hp. Cooper-Bessemer direct reversing Diesel engine with sailing clutch. The trawlers, *Amherst*, *Cornell* and *Dartmouth* are also sister ships 110′ long, 22′ beam equipped with 370 hp. Cooper-Bessemer direct reversing Diesel engines with sailing clutch.

In many fishing fleets, Diesel operated trawlers have been found to save as much as 25 per cent in operating expenses over the cost of steam operation. In the fishing industry, much of this saving can be passed along to the ultimate consumer.

Even when most food prices soar, the American houswife can still depend on Diesels, fish and cellophane to provide an attractively packed food product at a reasonable cost.

The trawler "Cornell" of the General Seafoods Corp.



SALMON CANNERY FLEET STANDARDIZING ON DIESELS

The Libby, McNeill & Libby salmon cannery fleet in winter headquarters on Lake Union, Seattle, Wash.

EVERY year sometime during the month of April, the Libby, McNeill and Libby Salmon Cannery Fleet sets out from Seattle for Alaska, where they operate fifteen canneries from Southeastern Alaska to the Bering Sea. The fleet of 60 boats includes both large carrier boats and small cannery tenders.

The three large boats, the *Otsego,* the *General Gorgas,* and the *Libby Maine,* carry enough cans and heavy equipment to start operations. Of the large carrier boats, only the *Libby Maine* is equipped with Diesel engines. This ship is 226 feet long, net tonnage 1,458 and is powered with two Dow Diesel engines.

The small Diesel equipped cannery tenders, ranging from 55 feet to 80 feet in length, leave at the same time for their home canneries loaded with all the fuel and supplies which they can carry. There are about 50 of these tenders, most of which are powered with Diesels.

The trip to the cannery requires from five to fourteen days' steady run, as the distances range from 800 to 2,500 miles.

When the tenders arrive at the canneries, other than those in the Bering Sea, they have two months' work getting ready for the season. They tow floating traps, pile drivers, and scows during this period, and by July 1, they are ready for the salmon run. When the salmon run arrives, the tenders work 24 hours a day bringing fish from the fish traps to the cannery.

When the traps are close to the cannery and do not require crossing open water, the tender will tow a scow and load it, but where the trap is a great distance from the cannery or across open water, the tenders bring the fish back in their holds. In getting the fish from the traps, the tender will pull up the trap and brail the fish into the hold or onto the scow.

In case there are not enough fish taken from the trap, the tender will proceed to other traps until it is completely loaded. The trip from the cannery to the traps and back usually requires from one to two days, as the distance to the farthest trap is about 100 miles. The tenders also pick fish up from the Seine boats and Gill net boats.

In the event the cannery runs short of fish, the tender will go two and three hundred miles to another district and pick up fish there. In the Bering Sea, no fish traps are allowed, and all the fish are purchased from Seine boats and Gill net boats.

The fish run lasts all the way from a month to three months. Following this, the tenders close the cannery for the winter and return to Seattle where they tie up until the next year.

The three large boats make about four round trips to Alaska carrying canned salmon to the market. These ships usually cannot carry the entire pack and the Alaska Steamship Company carries some of it.

During the season each cannery tender will run about 2,000 hours. These boats are powered with Diesel engines ranging from 50 hp. to 150 hp. The 50 hp. engine has a lubricating and fuel oil cost of 13c per hour or less, making a total cost for the year of $260. The gasoline engine which the Diesel engines are replacing would have a total cost per hour of 70c or more, making a total operating cost of $1,400 per year, and a saving by Diesel engines of $1,140 per year on the 50 hp. engines.

In addition to this, there is a saving on the insurance rate as well as the elimination of the gasoline fire hazard. The fuel oil saving on the 100 hp. and the 150 hp. engines would be proportionately greater, or twice to three times as much.

As a result of these savings, Libby has standardized on Diesel equipment for any new boat and for replacing gasoline power. The majority of tenders are equipped with Diesels supplied by the Atlas Imperial Diesel Company.

For this service Diesel engines pay for themselves in from three to four years and give the operating advantage of sustained power under heavy load. About 30 per cent of the Libby Cannery Tenders are still gasoline powered, but this percentage is reduced every year as they replace gasoline power with Diesels.

The fact that Libby, McNeill and Libby have a comparatively short operating season and still find that Diesel operation pays for itself is evidence of the tremendous savings to be made by the use of Diesel engines.

NEW DIESEL POWERED TOWBOATS FOR THE TEXAS COMPANY

One year's successful operation brings repeat order for more Diesels.

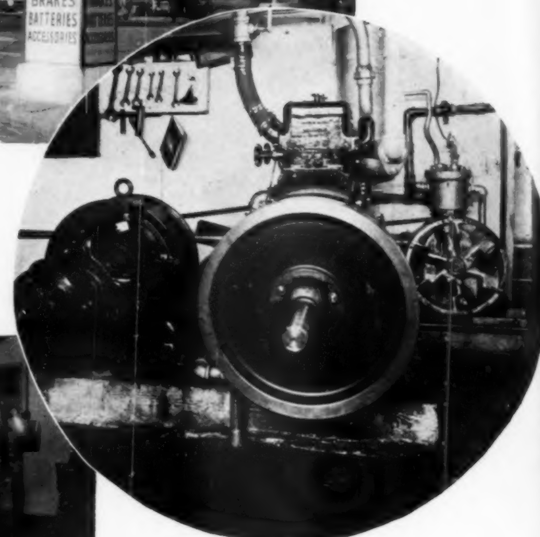
THE Texaco 325 and Caillou, two Winton powered towboats for The Texas Company, were laid down last year at The Pennsylvania Shipyards, Inc., of Beaumont, Texas. So successful have these Diesel operated towboats been that this year two additional tugs were ordered from the same yard by The Texas Company.

The first of these two new vessels, the Leesville, was recently delivered to the owners, and the fourth tug is going into commission this month. The Leesville is powered with a Model 152-6, six cylinder airless injection four cycle Winton-Diesel engine, 180 hp. 425 rpm. driving a 48″ diameter by 37″ pitch three bladed propeller, with total blade area of 6.7 square feet. On a trial trip, without forcing the main engine, a speed of 13.3 statute miles per hour at 400 rpm. was obtained with low propeller slip.

Of shallow draft but extra heavy, strong construction, these new tugs are designed for towing oil barges in the shallow waters of southern Louisiana. Hull complete, including shell with framing, bulkheads with stiffeners, as well as engine room casing, deck house, and all deck fittings are made of steel of electric-arc-welded construction throughout. Shell framing is of longitudinal "Staggered-Butt" type, for which patents are pending. Keel is 6″ x 2″ steel bar. Bottom plating is 3/8″ thick, side plating 5-16″ and deck plating 1/4″.

Engine room is exceptionally roomy due to V-bottom design, and is well ventilated. Machinery is securely bedded on strong, rigid, welded foundations. Commodious quarters are provided for the crew. In this compartment are fitted five pipe berths, one folding table, one stove, one sink, and one refrigerator. Lighting system consists of two 1500-watt 32 volt gasoline-engine driven electric generator units and one-mile ray searchlight.

Principal dimensions of the tug: length overall, moulded, 60 feet; beam, moulded, 15 feet; depth, moulded, 5 feet 9 inches; draft, light, forward 3 feet 3 inches; aft 4 feet 6 inches; draft, loaded, forward 4 feet; aft, 4 feet 4 inches; displacement at loaded draft 41 tons.



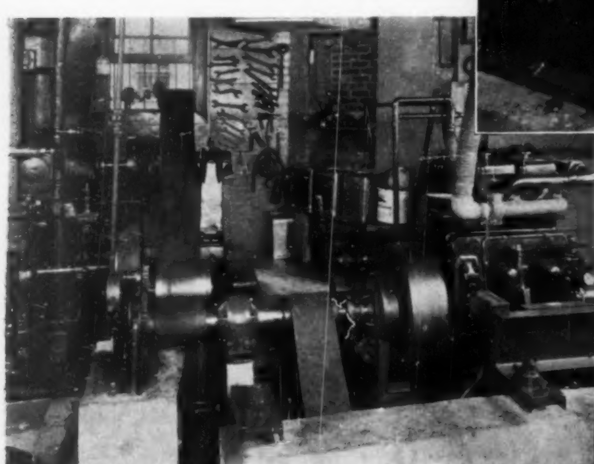
FOR A GAS STATION

Karel's Gas Station in North Bergen, New Jersey. Diesel equipped to save money on the cost of high powered lighting and compressed air.

Above — This 18 hp. 2-cylinder Lister Diesel operates a 12 kw. 3-phase 220-volt generator to supply the lighting for Karel's Gas Station and also drives their air compressor.

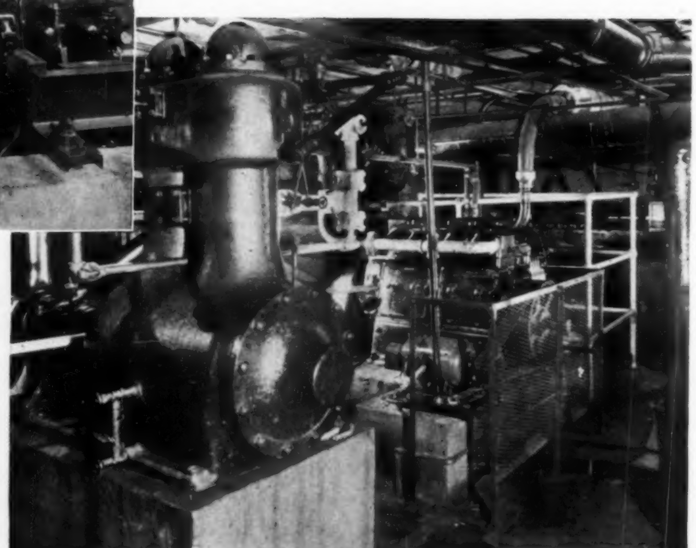
IN A CHOCOLATE FACTORY

Right — Saving 88 per cent in the cost of operation, this 27 hp. 3-cylinder Lister Diesel operated during the month of June for 246 hours on 290 gallons of fuel at a cost of $17.40, 5 gallons lubricating oil $2.50 — total $19.90. It is installed in the factory of Chocolat-Menier, Hoboken, New Jersey. The engine drives an ammonia compressor and a 15 kw. generator which provides lighting for the building and power for 15 hp. of motor when compressor is not running. Saving on power is about $125 a month and on lighting $42. Total monthly saving $167.



IN AN APARTMENT HOUSE

Above — 875 Park Avenue, New York City, is the location of a first class apartment house where the refrigeration for each apartment is supplied by a 2-cylinder ammonia compressor driven by an 18-22 hp. 2-cylinder Lister Diesel engine. The engine operates about 9 hours a day in winter and 15 hours a day in summer. Fuel and oil costs for a 30-day period are about $21.00. Saving of 85 per cent in operating cost over previous cost of $149.



IN A MEAT PACKING HOUSE

Left — Running 20 hours a day in summer and 9 hours a day in winter, this 38-42 hp. 4-cylinder Lister Diesel operates a 20-ton twin cylinder ammonia compressor at the packing plant of E. Greenebaum & Sons, New York City. The total fuel and oil costs during the summer months are less than $70.00 for a 30-day period. The previous cost of electric current for operating the 40 hp. motor which the Diesel engine replaced was about $650.00 per month. A saving of 89 per cent in the cost of operation.

DIVERSIFIED APPLICATIONS

THE ELCO 48. *A new motor yacht hailed as the outstanding value of the year. Modern in every line, streamlined without being carried to impractical extremes, she is low, graceful, and an exceptional sea boat. Her accommodations are a triumph of skillful design. Three staterooms and the deckhouse divans sleep a party of six. Quarters for crew of two. Speeds up to 26 mph.*

Standardized
DIESEL CRUISERS

48'—Ready for Immediate Delivery—38'

ELCO Standardized Diesel Cruisers, built in the two sizes illustrated, save one-third of the operating cost over similar gasoline engines and their cruising radius is increased by fifty per cent.

The Elcos shown herewith, as well as others, are on display at Port Elco. Inspect them there at your leisure, or write for illustrated descriptive literature.

with
Vibrationless Power
and
Sound-Proofing

Port Elco

The Permanent Exhibit of Elco Cruisers

111 East 46th St., N. Y. C. (Wick. 2-3830)

Plant: THE ELCO WORKS, Bayonne, N. J.

Elco
CRUISERS

CUSTOM CRUISETTE 38. *The ideal cruiser for the man who wants a big, able, commodious cruiser, but likes to handle her himself. Her length and Elco's deck cabin arrangement eliminate all crowding. She sleeps eight in comfort, with the privacy of two separate cabins. Open cockpits fore and aft provide sunshine space for large parties.*

DIESEL CRUISERS

. . . . *Continued from page 12* . . . .

ers suspended at each end in large rubber pads held in place by angle irons bolted to the heavy bulkheads. Rubber mounting is employed by other builders.

One factor contributing to the smooth flow of vibrationless power and lack of fluctuation in the steady progress of a Diesel standardized cruiser is the fact that it is governed. The uncanny action of the governor in maintaining one fixed engine speed adds greatly to the ease of operating, likewise relieving the boat of much strain which a "racing" gasoline engine can impart. The operator of the Standardized Diesel Cruiser finds that he need not constantly follow the changing revolutions of the propeller with the throttle as the propeller comes partly out of water in a bad seaway as he must do with the gasoline engine, waiting till it gathers speed and then probably having to again adjust the throttle to suit conditions. The governor automatically accomplishes most of this work and it has been our experience that the Diesel powered cruiser maintains a much better "way" through the rough seas and we feel that it makes more speed under such conditions than does the gasoline powered boat.

Owner operation of small Standardized Diesel Cruisers is the rule and manufacturers of oil engines (and we say "oil engines" advisedly because not all small oil engines are Diesel type engines) have been constantly working toward producing machines which the average man who owns and operates a boat – the doctor, banker, broker, architect, business executive, salesman or what have you – can understand and run with reasonable success. They have performed wonders in this respect, for we know of many non-technical men who operate their Diesel engines and make their own adjustments and minor repairs and who obtain good service from the oil engines in their boats. Of course, with almost everyone operating an automobile, the gasoline engine in their boat has been a familiar piece of mechanism and it is not to be expected that the average man will at once be as expert in operating his small Diesel engine. The smaller the cylinder size and the higher the revolutions of the Diesel engine, the greater the necessity for nicety in adjustment of the fuel injection system and the more urgent the need for understanding and properly operating this important feature, especially since the yacht owner doesn't want smoke and odor which careless or unskilled operation might entail. Diesel engine manufacturers are making it simple and easy for the operator. Much has been accomplished in simplifying the intricacies of the fuel injection system, this being practically the most novel feature to the operator. We do not ourselves feel that this contains any more pitfalls than does the electrical system of a gasoline engine, where hidden short circuits often cause exasperating irregularities.

The boat builder and the engine manufacturer are combining their skill and facilities to produce for us a remarkable craft for pleasure use in the Standardized Diesel Cruiser, a rare combination of safety and economy, at a price but a fraction above that of the gasoline powered standardized cruiser and even the "recent depression" failed to halt this progress. We predict in all sincerity that within the next five years that every builder of a standardized cruiser will – nay, *must* because of popular demand – sell Standardized Diesel Cruisers.

A CORRECTION

A regrettable omission was made in our May issue in regard to the article "Old Man River," which described and illustrated the new towboat *Coiner*. The author of this very excellent description was Mr. H. H. Haas, member, A.S.M.E. We sincerely regret that due credit was not given to Mr. Haas as the author of this article.

DIESELS SAVE $220,079

. . . . *Continued from page 15* . . . .

ing floor tank from which lubricating oil is pumped to the engine lubricator. Used oil from the engines flows by gravity to individual tanks from which it is batch filtered through a centrifuge and returned to the proper supply tank. A daily log is kept of fuel and lubricating oil, kilowatt hours, etc., which is tabulated on a sheet for a monthly summary showing the average kilowatt hours per gallon for each engine, running time and load factor. The engine cooling system is the closed type consisting of circulating pumps, heat exchanger and cooling tower. Inlet water to the engines is maintained at a constant temperature by means of an air operated automatic valve. A low pressure – high temperature alarm is included in the system. A workshop contains all necessary equipment including pipe tools, drill stand and lathe.

Here are some of the benefits which have accrued. There is no city bond levy as all general obligation bonds are met from earnings of the plant. The total city indebtedness has been reduced to $6,000.00. During the year 1933, 114,000 kilowatt hours were furnished for street lighting for which no charge was made. If this service had been paid by taxation it would have meant an 8-mill levy. In 1924, the city tax levy was 59 mills. In 1933, this levy had been reduced to 29 mills. In December, 1932, and December, 1934, the light plant assayed the role of Santa Claus and presented its local patrons with receipted December light, heat and power bills. The Christmas gift was worth over $3,000.00 for each month.

There is no indebtedness against the present plant or any other municipal improvement that has been made within the last decade. All costs have been met from the current city funds. Since 1927, $121,609.91 has been transferred from the light fund to other city funds for improvements as follows:

1927	$ 1,800.00
1928	16,000.00
1929	18,500.00
1930	16,200.00
1931	32,000.00
1932	6,200.00
1933	13,950.00
1934	16,959.91
	$121,609.91

Plant output has increased from 220,000 kilowatt hours in 1920 to 1,190,500 kilowatt hours in 1933. Bloomfield has no industrial load, necessitating concentration on the domestic load. With a net rate of 2.7 cents per kilowatt hour for domestic heat and refrigeration, over 100 electric ranges and about 125 electric refrigerators have been added to the lines. The rate for commercial and domestic lighting runs from 5.4 cents to 1.8 cents.

Sewage treatment is another problem solved by Bloomfield officials. Prior to 1930, city sewage was discharged through two septic tanks, fast becoming inadequate for the increased load. Following a careful survey, decision was reached to construct a modern sewage plant about a mile from the city, two acres of land being purchased as the site. The plant consists of a double-hopper Imhoff tank discharging the clarified sewage through cast iron pipe lines and nozzles onto a trickling filter. The effluent from the trickling filter flows through a secondary settling tank which is circular in shape and has a conical bottom, the sludge from which is pumped back to the digestion chamber of the Imhoff tank by a self-priming centrifugal pump located in a small pump house adjacent to the dosing tank. The effluent from the secondary tank flows to a concrete bulkhead located on a nearby creek. In addition to the plant there are two raw sewage lift stations with connecting pipe lines. One lift station is equipped with two Fairbanks, Morse 200 gpm. pumps and the other with two 50 gpm. pumps. Both are horizontal, direct connected to automatic controlled motors. The total cost of this improvement was $45,463.32. It was paid entirely from available funds on hand.

The most recent addition to Bloomfield's municipal improvements is the shallow well system, completed during the summer of 1934. The city's water supply, until this year, has been obtained from an 1800 foot well, drilled in 1900. Water from this deep well contained 1,070 ppm. total hardness and 2.5 ppm. iron. It was not satisfactory, as the following schedule of per capita consumption reveals. This schedule also shows the results of 100% metering:

	1926 60% *metered*	1930 100% *metered*
Total gals. pumped	29,968,400	19,163,500
Gals. per capita per day	36	23
Total collections	$3,973.13	$4,598.24
Revenue per 1000 gals.	.134	.24

The same rate was in effect during both years.

In the summer of 1932 test holes were sunk in the Fox Creek Valley, about a mile from the city, to determine the advisability of shallow wells. It was found that this valley contained an extensive sand and gravel strata that should yield an adequate supply of water with a total hardness of 201 ppm. and about 10 ppm. iron. Two wells of the gravel pack type were drilled to a depth of 40 feet. Each well was equipped with a turbine type pump to pump to the aerator of the new water plant to be constructed near the light plant. An eight inch pipe line was laid to the plant site and a transmission line built with remote control circuits to operate the pumps from the plant. Most of the work was done as a P.W.A. project with a Federal grant of $3,200.00. The remainder of the cost was met with cash on hand.

A new water plant was constructed in 1934 as a P.W.A. project on which a grant of $5,000.00 was made. The plant was constructed on a city owned lot across the street from the light plant and consists of a two-story building with basement, settling tank and clear water reservoir. At the present time the plant is used only for iron removal by aeration, settling and filtration, without the addition of chemicals. The plant however was designed for the addition of chemicals in the future as well as softening.

The pumps at the wells bring the water to the aerator, whence it flows through the entire plant by gravity. The aerator is a pan type, screened in, and is mounted on top of the settling basin. From the aerator the water goes into a rapid mixing box which was designed for a mechanical mixer in the future. The next step is a slow mixing chamber, to be equipped with baffle boards. The settling basin has a retention period of about 12 hours at the present rate of pumping and is constructed with inlet and outlet weirs and baffle wall to lengthen the flow. The bottom is divided into four hoppers with stand operated valves to drain the sludge to the sewer. Two eight by ten foot rapid sand filter boxes were built, however only one has been equipped at the present time. Filter equipment consists of manually operated valves, rate of flow controller and loss of head gauge. From the filter the water flows to a 100,000 gallon clear water reservoir located under ground at the rear of the building and under the filter boxes. The filter wash pumps and high lift pumps are located in the basement of the building and have submerged suctions under normal operating conditions. Two 250 gpm. high lift

pumps were moved over from the old plant and a new 100 gpm. high lift pump and a 1500 gpm. wash pump were installed. The discharge from the plant is metered through a turbine type meter as it goes to the distribution system and 50,000 gallon elevated tank.

In order to eliminate additional operating labor an indicating control system was installed whereby the light plant operator across the street could operate both plants. An indicating control panel is located in the light plant building which shows the depth of water in the clear water reservoir, flow of water into and out of plant, maximum height of water in the settling basin and elevated tank. The high lift pumps are also controlled from this point as well as the well pumps a mile from the city. A duplicate of this panel is located on the operating floor of the water plant, making a two-point control and indication of the plant operation. The operating floor has space for future chemical machines and other equipment. A reduction to .4 ppm. iron is obtained by this plant without any chemical application. The total cost of this plant was $19,906.83 and was paid with funds on hand.

C.W.A. Labor was used during the early part of 1934 to add 4,500 feet of mains to the distribution system. The cost of material for this work amounted to $4,509.55.

Each of the three utilities is operated independently of the others in so far as operating costs and receipts are concerned. Water and electricity is sold to the other departments on regular rate schedules and labor is segregated to the proper utility. The only free service is for street lighting and water for fire hydrants. No tax levy or charge is made for either of these services.

During the past two years the city has been purchasing county warrants, as an investment and to stimulate the circulation of money in the community. As much as $12,000 has been invested in these at one time.

Further evidence of the success of these utilities is the fact that the same city administration has held office for the last ten years and at the last municipal election there were no other candidates in the field.

FLOATING POWER PLANTS

. . . . *Continued from page 19* . . . .

facts — not lucky breaks — to get business and hold it.

When the Superintendent of the Panama Canal wrote the Boston Tow Boat Company three years ago asking for facts and opinions on which to decide a question of Diesel-electric power versus steam he got back a detailed statement from them that could leave no room in his mind for doubt. "We would unhesitatingly recommend such a Diesel-electric power installation for the kind of work you specify" concluded their report.

The Tees Towing Company of Middleborough, England, established in 1835 and said to be the oldest towboat company in existence heard the rapidly spreading fame of the *Venus* and *Luna* after being placed in service, and sent a commission of engineers and officials over to study them at first hand. In three weeks they were on the way back with reports of enthusiastic praise, recommending the building of a similar one. The result was the British Diesel-electric towboat *Acklam Cross.* Some time afterward the Tees officials wrote the Boston Tow Boat Company saying: "*Acklam Cross* has been in service eighteen months now and has given us every satisfaction."

Among other inquiries answered by the owners of *Venus* and *Luna* was one from the Royal Swedish Board of Lighting, Pilotage and Life Saving, concerning such a Diesel-electric power installation for a new lighthouse tender.

What is so remarkable about these two Diesel powered craft that prospective builders now seek to pattern theirs after them?

A brief description of their power plant installations and control systems will perhaps explain their outstanding ability.

For engines each of the twin towboats, alike throughout, has a pair of 325 bhp. four-cycle. six-cylinder, airless injection Winton Diesels. Each engine is connected to a G-E shunt generator rated 213 kilowatts producing at 300 rpm. 250 volts, and a 25 kilowatt exciter mounted on the same shaft.

These generating sets furnish electric power through a central switchboard for the operation of a 516 hp., 125 rpm. 500-volt double propulsion motor consisting of two 258 hp. 250-volt motors mounted on a single shaft with two bearings. Exide storage batteries comprising 56 cells are floated on the auxiliary circuit thereby providing positive assurance that electric power for the vital auxiliaries will never be interrupted.

With both Diesel motors running, their machinery develops normally 650 brake horse power and is capable of very great overload for short intervals.

"Our installation is such that we have twin power plants of every power and auxiliary unit" states the engineering department, "which means that we can have a 50 per cent breakdown of all the units of the boat *and still produce 70 per cent of the power on the propeller and 80 per cent of the speed of the boat.* This, in turn, means uninterrupted service even if we were subjected to a major breakdown of either Diesel engine. Or to put in another way, we can have a breakdown of half of all the auxiliaries without it affecting or detracting from the operation of the boat under full power."

The main motors are operated directly by hand controllers in the pilot house. Instead of signalling the engine room for more power with consequent delay in transmission and the possibility of mistaken signals the captain merely moves the motor control. A dual system allows him to operate the control from either side of the pilot house or from a station aft on the upper deck. There are eight speeds forward and eight astern. Steering is electric also, using the hydro-electric gear. Overhead and directly in front of the pilot are dials that register the amperage being used and the propeller speed ahead or astern.

Diesel-electric power has proven these very definite advantages over steam for towboat work, concludes the engineering staff of the Boston Tow Boat Company:

1 Ability to get under way quickly. The only time factor is assembling the crew when an emergency call comes in at night. Even on the coldest nights one-minute starting is the rule whereas getting up steam with banked fires requires at least one hour and a half.

2 Greater "stand by" economy, a tremendous factor in tugboat work resulting in 100 per cent fuel economy. Fuel is burned only when the boat is in actual use.

3 Less time necessary in replenishing fuel supply. Fuel oil is taken aboard *on an average of only once in five weeks* as compared with a steam tug of equivalent size which must be coaled once and sometimes twice a week and take on water twice weekly or oftener.

4 Positive continuous power with ample power reserves as contrasted with the steam tug which usually operates at her full capacity all the time, but which after operating at full capacity for a number of minutes loses power because her steam pressure drops. This leaves the steam tug with reduced power if an emergency should immediately follow. The Diesel-electric tugs can be run at normal power and still have an ample reserve available at all times.

5 Less crew, with fewer numbers of qualifications per man.

6 Clean. No smudge of heavy smoke to discomfort passengers on decks of passenger liners, or to mar freshly painted surfaces. Nor is there smoke or blown-off steam to obscure the vision of pilots when wind directions are unfavorable.

7 An appreciable saving in hull space and improved working conditions for the crew.

In summing up the various factors that resulted in the selection of Diesel-electric power instead of steam, despite the fact that the initial cost of Diesel-electric power was a third greater than for steam, here is one that perhaps more than anything else influenced them in favor of a Diesel installation. KEEPING ABREAST OF THE TIMES BY READING EVERYTHING THAT APPEARS IN BUSINESS PUBLICATIONS DEALING WITH POWER PROBLEMS!

Knowledge is power.

STREAMLINER CITY OF PORTLAND

UNION PACIFIC will place their famous streamline Diesel train in regular service between Portland, Oregon and Chicago on June 6. The train has been lengthened to seven cars and now includes power, mail-baggage-express, coach-buffet, dining lounge and three Pullman sleeping cars.

This spectacular train is driven by a 1200 hp. Winton Diesel engine and will operate on a schedule of 39 hours, 45 minutes, averaging 57½ mph. between Portland and Chicago via Omaha, Nebraska. This Union Pacific Diesel train will thus be the first to operate regularly on a transcontinental route.

NEW YORK DIESEL ENGINE SHOW

IN response to an ever increasing demand for information, the first all Diesel Engine Show ever held East of Chicago will open in New York City on June 15 and extend through June 23.

The interest being shown in Diesel engines all through the East has prompted the various manufacturers and distributors to exhibit their wares to the public.

Inquiries from fleet owners throughout the heavily populated Eastern district is indicative of the general trend toward Diesel engines for automotive equipment. The enormous amount of freight carried by motor freight lines makes Diesel the practical motive power. Motor bus travel also is on the increase through this section and the biggest year in history is predicted by bus line operators. These factors – the highly improved motor truck and the comfortable fast motor coach – have been big factors in speeding up the general adoption of the streamline Diesel powered railroad train to meet this competition.

A progressive Diesel School has been a big factor in creating and stimulating interest in various lines of Diesel operation and installation. Motion pictures accompanied by lectures have been shown throughout the East before engineering organizations, the engineering classes of large Eastern colleges, sales and equipment organizations, etc. The enthusiastic reception of these pictures and lectures is indicative of the trend of the mechanically minded toward what is termed "the World's Fastest Growing Industry."

It is expected that the Silver Comet Diesel powered racing car which made history at Daytona, Florida, this Spring, will be on exhibit during the Eastern Diesel Engine Show. If the interest created by this racer at the Los Angeles and Chicago Shows can be taken as a criterion, this car, with its Waukesha truck Diesel motor, should attract those who wish to keep abreast of the rapid progress being made by the high speed automotive Diesel adaptable for trucks, etc.

Several Diesel engines will be exhibited at this New York Show which is to be held in the largest exclusive Diesel School in the world, occupying the entire building at 31-28 Queens Boulevard, Long Island City, N. Y. This location is conveniently reached by car or subway, surface and bus lines.

TALE OF TWO CITIES

. . . . *Continued from page 7* . . . .

the station consisted of four return tubular boilers totalling 580 hp. operating at 130 pounds pressure, two engines driving generators, and a 200 kw. and a 600 kw. General Electric turbine, totalling 1,200 kw.

The steam plant, however, was not able to produce apace with the mounting demand for current and outside power was required.

At the end of 1918 a 1,000 kw. connection was made with the outside transmission company and the station operated parallel with the transmission company until 1928.

The transmission company imposed usual conditions. It required Hudson's plant to spend $20,000 of its own money for a substation to receive the transmitted electricity, required payment for a minimum amount of electricity, equivalent to half the plant's annual output, whether the electricity was taken or not, and set the term of contract at five years.

Faced with the problem of a more satisfactory method of power generation Hudson had four alternatives: (1) Purchasing all power from the transmission company. (2) Building a new steam station to operate at high pressure and superheat, replacing their then present steam generating equipment which had become obsolete and was fast deteriorating. (3) A combination of (1) and (2). (4) Installing a Diesel power plant.

Hudson declined to renew the unfair contract with the transmission company when it found that it could generate its own requirements with Diesels for about nine mills per kwhr. as against 1.25 cents a kwhr., the transmission company's best offer. It also voted not to sink money into an elaborate steam plant which might become obsolete too soon and entail costly sums for later additions.

Finally after a year and a half of careful investigation and an exhaustive study of production costs, Hudson's Commissioners of Public Works, backed by an intelligent vote of the people, decided in favor of Diesels.

In April, 1928 the Town of Hudson purchased two 900 hp. and one 675 hp. McIntosh & Seymour Diesel engines direct connected to 2,300 volt, 60 cycle generators and remodelled a portion of its old station for their installation. The engines were started on New Year's Day, 1929 and over a rigid test period of six months demonstrated that they could fill Hudson's entire electricity requirements beyond all doubt. On July 1, six months later, Hudson severed its connection with the transmission company and declared its independence of outside power control.

With the completion of the new Diesel plant the cost of operation dropped greatly, so much so, that rates were materially reduced during the two years following. Low rates and judicious advertising built up many more customers in the meantime.

The change to Diesel was financed by a bond issue of $40,000 payable annually at the rate of $4,000 plus a surplus of $127,000 that the Light and Power Department had accumulated during the previous six years.

Despite the low rates made possible with the new Diesel equipment more surplus was accumulated and in 1932 the department, after turning in $35,000 to the town treasury for tax reduction, found that it still had about $85,000 surplus left. As business was still increasing at a healthy rate despite the surrounding depression and costs were low, the station building was completely modernized and a fourth engine, a McIntosh & Seymour Diesel of 1,200 hp. was purchased and put into operation on February 1, 1933.

Continuing to pile up surpluses the Town of Hudson's Light & Power Department last July passed on still another reduction.

Here is what the people of the Town of Hudson pay for electricity under rate schedule "A":

First	20 kwhrs. per month	@ 5 cents net
Next	80 kwhrs. per month	@ 3 cents net
Next	100 kwhrs. per month	@ 2 cents net
Over	200 kwhrs. per month	@ 1 cent net.

At any "off peak" period when the engines are not fully loaded, during certain periods of the day, such as nights and between the factory load and the evening load in the summer as well as on Sundays and holidays, the plant can sell electricity profitably at two or three mills per kwhr. above the fuel cost which is about $3\frac{1}{2}$ mills per kwhr. These rates have been the means of attracting much new business.

Hudson's Diesel light and power plant now serves over 3,200 customers, including the neighboring town of Stow, through 85 miles of overhead lines. More than 94 per cent of the cost of the plant has been paid out of earnings and it is in excellent physical condition with a Depreciation Fund of over $36,000.00 established part of which will be spent for another Diesel engine when the need arises. There is only $28,000.00 of outstanding debt. Diesel engines have proved a most profitable investment.

In the last ten years the average domestic lighting rate has decreased from 10 cents to 3.8 cents per kwhr. Output has increased 162 per cent in ten years with only 21.6 per cent corresponding increase in expenses.

For the year ending December 31, 1934 the department received an income of $131,500.29. Subtracting expenses of $97,004.79 it left a gross profit of $34,495.50.

Hudson pays $5,000 annually for street lights. These same street lights at the adjoining municipality prices would be $12,400. Here is a clear saving of $7,400 a year.

Asset though it is to the Town of Hudson, this and the 40 other municipally owned plants in Massachusetts have had to contend with a steady campaign of insidious propaganda spread by jealous electric power interests, who, seeing in them a threat to their unjustified profits, have launched here and there undercover schemes by which they might be taken over.

A promising field for Diesel development, inadequate laws have imperilled the future of these municipal lighting plants and they are new nearing the crossroads. Political interference and a hostile electric power industry still threatens their continued growth.

A subtle strategy practiced by electric power companies in all too many instances, consists of dropping their rates when a municipality starts plans for the establishment of its own plant and keeping them low until all agitation has quieted down and the plans are abandoned. Many engineering companies and Diesel engine builders have seen this strategy operate to their own detriment and to the future detriment of the communities whose interests were involved.

Yet what Hudson has accomplished in providing its citizens with a plentiful source of low-cost electric current and dependable service, with the savings in production costs passed directly on to consumers, can be duplicated by hundreds of other communities in Hudson's class today by this simple formula:

DIESELS *plus* HONEST EFFICIENT MANAGEMENT *equal* LOW RATES.

AT TULSA, OKLAHOMA

THE Oil & Gas Power Division of the American Society of Mechanical Engineers held their annual meeting at the Mayo Hotel, Tulsa, from May 8 to 11. Probably the most interesting paper read at that meeting was written by W. F. Joachim on "The Characteristics of Diesel Fuels" and hereunder we briefly recapitulate Mr. Joachim's paper.

The performance of Diesel engines, and their operating and maintenance costs, depend on two major fields of industrial development:

(1) *Internal Combustion Engineering,* which includes engine design details, fuel injection and combustion control methods, volumetric, mechanical, cooling and exhaust efficiencies, materials, production methods, and operating care and maintenance.

(2) *Crude Oils and Refining Methods,* which for Diesel fuels includes ignition qualities, specific gravity, volatility, combustion or carbon residue, the percent of cracked products in the fuel and other fuel qualities.

Although previously published work on Diesel fuels has been largely confined to the determination of ignition qualities, this work included records of complete fuel performance, 25 straight-run distillates, cracked distillates, and residuums, crude oil, regular plant stocks and blends being tested in a C.F.R. research Diesel and at seven loads in a Cooper-Bessemer E.P. 3 Marine Diesel Generating Set.

Average results at full load showed that engine performance varied with fuel characteristics as follows:

Combustion Knock Intensity ranged from 1.2 to 3.8 for cetene numbers from 76.5 to 35.0.

Fuel Consumptions ranged from 0.390 to 0.440 lb./B.H.P. Hr. for A.P.I. Gravities from 43 to 17.

Exhaust smoke density and sparks, lubricating oil contamination, and indications of engine wear were greatest with fuels containing cracked residuums.

The complete paper includes descriptions of the test equipments, data at various engine loads, discussions, and 32 figures. A reprint of Mr. Joachim's paper may be obtained from M. J. Reed, Secretary, Oil & Gas Power Div., A.S.M.E., 12th floor, 2 West 45th Street, New York, N. Y.

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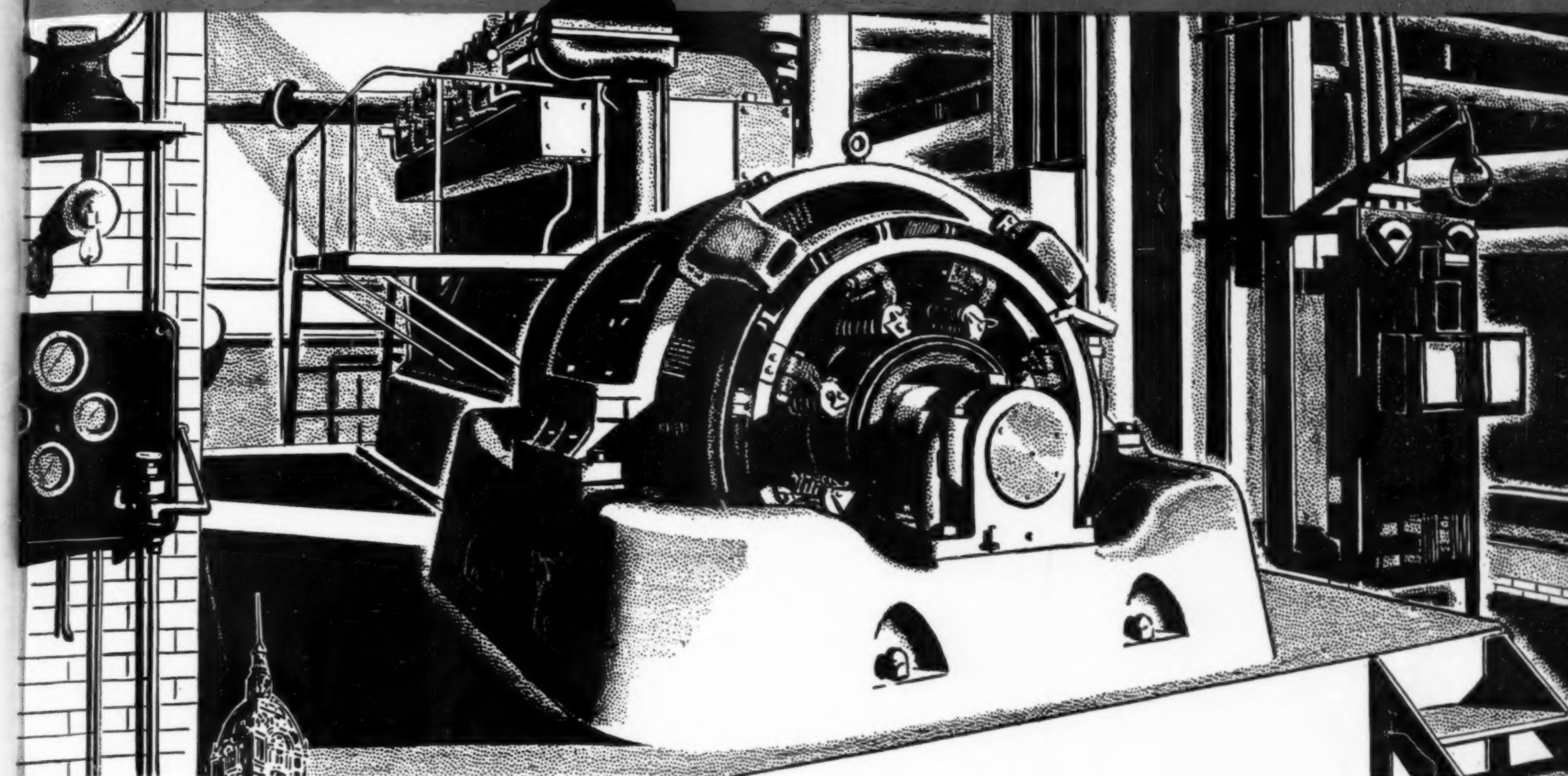

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